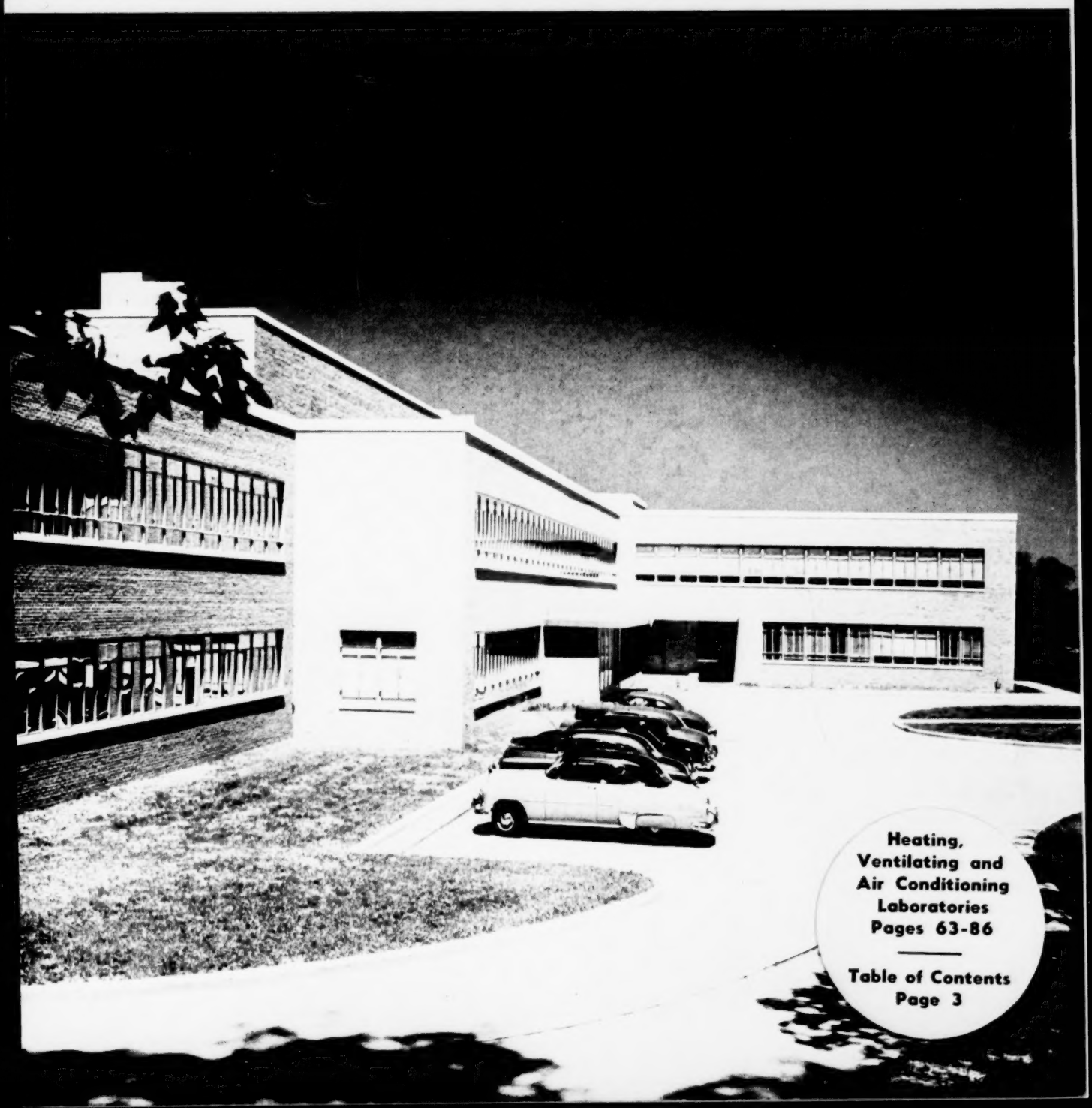
NOVEMBER, 1953

HEATING AND VENTILATING

INCLUDING AIR CONDITIONING – PIPING – REFRIGERATION – AIR SANITATION



Heating, Ventilating and Air Conditioning Laboratories Pages 63-86

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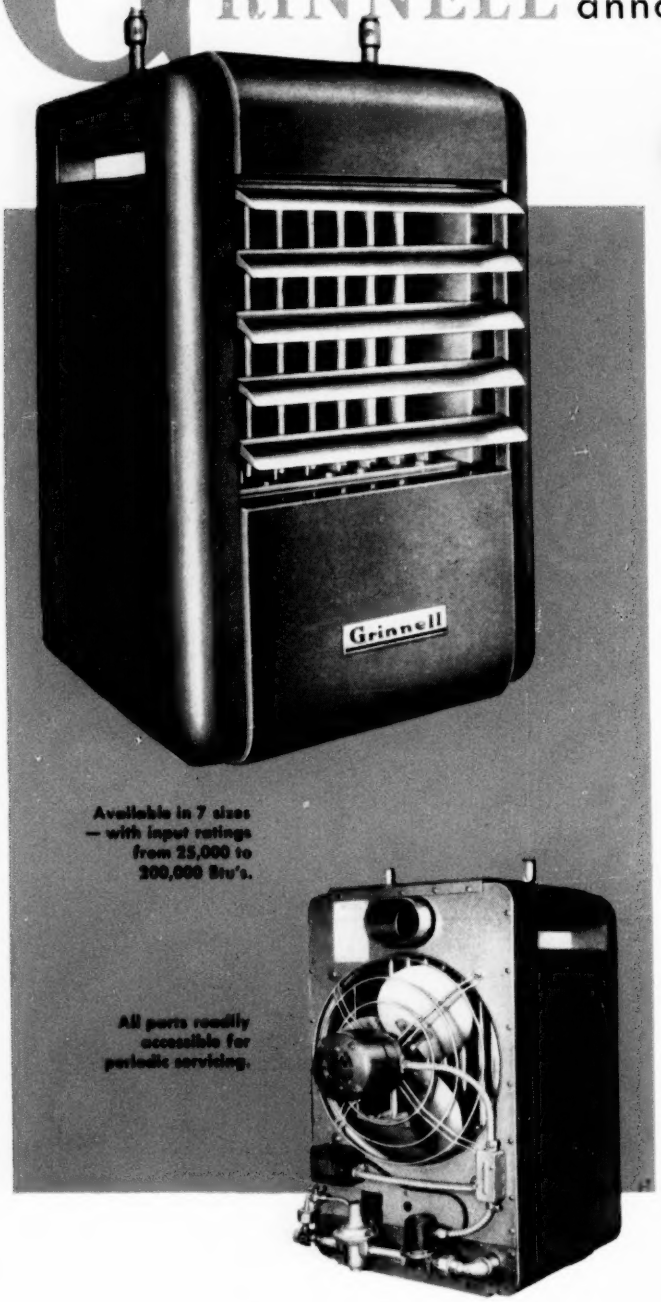
GRINNELL announces its new line of

GAS-FIRED UNIT HEATERS


Grinnell
Available in 7 sizes — with input ratings from 25,000 to 200,000 Btu's.
All parts readily accessible for periodic servicing.

AUTOMATIC! EFFICIENT! ASSURE YEARS OF DEPENDABLE SERVICE

Grinnell gas-fired unit heaters are easy to install, simple to operate and maintain. Efficient performance assured — with any type of gas — by modern design of burners and heat exchanger, proper motor and fan unit.

Automatic safety pilot operates to shut off main gas supply if pilot burner goes out. Flashback and extinction noise prevented by the burners' raised port design and proper port size for the gas used. Low speed motors have built-in thermal overload protection and automatic reset.

Additional features of Grinnell *gas-fired* unit heaters . . .

- Casing die-formed of heavy steel, with baked-on enamel finish
- Heat exchanger tubes and draft diverter of aluminized steel
- Combustion chamber of heavy steel, welded
- Burners of close-grained iron castings
- Adjustable louvers
- Burners and control assembly removable as a unit
- Hinged bottom pan permits cleaning interior of tubes
- Threaded pipe hangers for easy suspension
- Only wiring required is connection to room thermostat or manual switch
- Approved by the American Gas Association

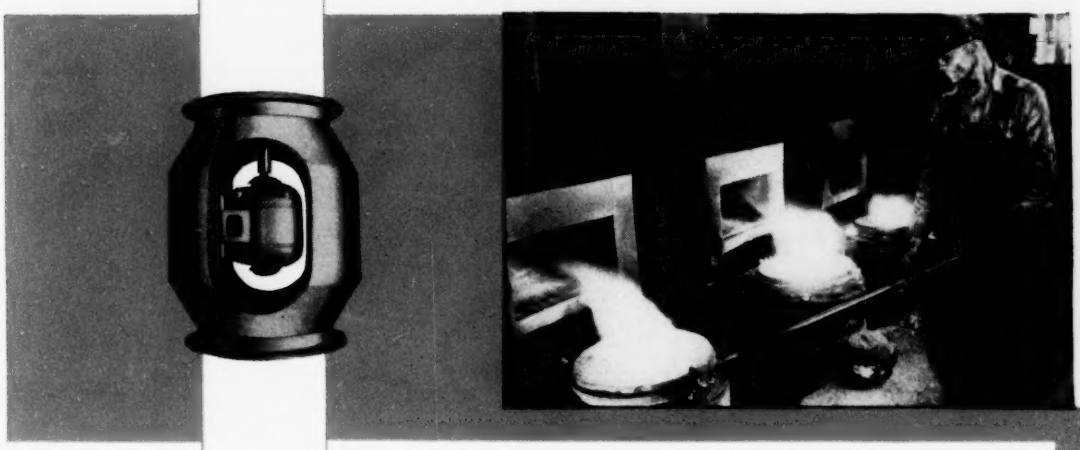
WRITE FOR CATALOG

GRINNELL
UNIT HEATERS FOR STEAM, HOT WATER, GAS

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

Manufacturer of: pipe fittings • welding fittings • forged steel flanges • steel nipples • engineered pipe hangers and supports
Thermolier unit heaters • Grinnell-Saunders diaphragm valves • prefabricated piping • Grinnell automatic fire protection systems

HOW TO EXHAUST FUMES FROM BOILING BRASS . . . WITHOUT HOODS



In brass melting furnaces, normal temperatures run from 1850° to 2350° F. Terrific heat and irritating fumes are given off by these open furnaces.

To improve working conditions around their furnaces, Standard Brass Manufacturing Company of Kansas City, Missouri tried several fan and hood systems without success. Then they installed five DeBothezat Bifurcator Fans, one for each two furnaces. Bifurcators with 27" diameter fan wheels and 2 HP motors, operating at 1140 RPM, were selected. The high velocity of these DeBothezat Bifurcator Fans made it possible to use open ducts behind the furnaces in place of hoods above them.

Now working conditions around the furnaces are satisfactory. And furnace charging and unloading is safer, easier and faster *without hoods.*

DeBothezat Bifurcator Fans are ideal for installation where space is limited, because they are compact, and install right in the duct work. Bifurcator Fans can be made of carbon steel, stainless steel, rubber coated steel, monel metal and many other corrosion or heat-resistant materials.

Ask your DeBothezat representative. You'll find him listed in the phone book under "Ventilating Equipment," or write our factory, Dept. HV-1153, for illustrated catalog DB-4-53. Either way, there's no obligation.

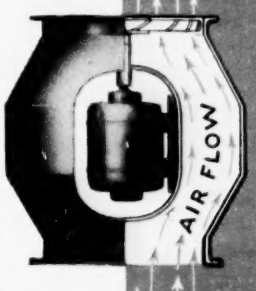
DeBothezat Fans

Division of American Machine and Metals, Inc.

EAST MOLINE, ILLINOIS

HOW BIFURCATOR WORKS

The Bifurcator is a motor driven axial-flow fan in a patented, divided housing. Motor is in an isolated chamber around which flue gases are by-passed (bifurcated) so that the motor always remains cool, clean and accessible. Bifurcators are available in many sizes from 1140 CFM (12" diameter fan with 1/20 HP motor) up to 45,000 CFM (48" diameter fan with 20 HP motor).



Webster-Nesbitt Down-Blow Unit Heaters up in the air, out of the way, provide heat for the gymnasium. Up in the air and along the wall, also out of the way, are the Webster Series "26" Traps draining the units.

Left: Webster Type E Convector alongside ironer in home economics department. The metal front is finished in a bright contrasting color.

HIGH SCHOOL FOR 1000 STUDENTS

When first put in service in September 1951 the new Ewing High School had 665 pupils from grades 7 to 10 using 24 of the 32 classrooms. Full capacity will be used by fall 1953 according to advance estimates.

Ewing High School is steam heated. Webster Heating Equipment used includes:

Webster-Nesbitt Down-Blow Unit Heaters in gymnasium as illustrated.

Webster-Nesbitt Propeller Fan Unit Heaters in locker rooms, manual training rooms and cafeteria kitchen.

Webster Convectors in home economics room (illustrated), auditorium, corridors, stair landings.

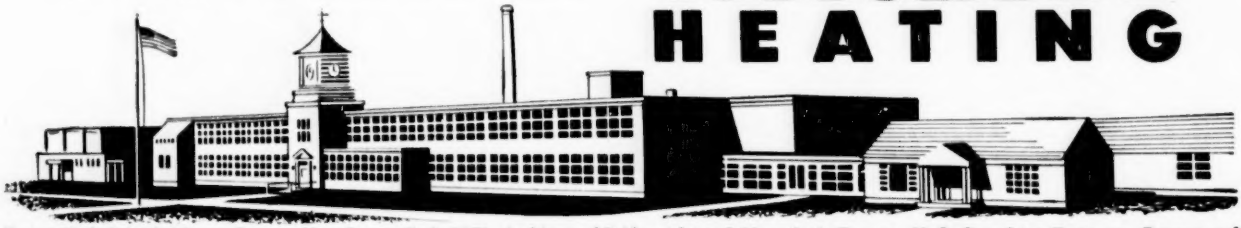
Webster Radiator Valves, Thermostatic Traps and Float and Thermostatic Traps throughout to assure steam circulation.

Modern schools and Webster Heating Equipment are found together all over America. For more information call your Webster Representative or write us.

Address Dept. HV-11

WARREN WEBSTER & COMPANY
Camden 5, N. J. Representatives in Principal U. S. Cities
In Canada, Darling Brothers, Limited, Montreal

Webster HEATING



Ewing High School, Mercer County, New Jersey. Built 1951. Architects: Micklewright and Mountford, Trenton, N. J. Consulting Engineers: Runyon and Carey, Newark, N. J. Heating Contractor: Walter E. Bittner, Trenton.

HEATING AND VENTILATING

A MONTHLY MAGAZINE FOR ENGINEERS AND CONTRACTORS CONCERNED WITH THE DESIGN AND APPLICATION OF AIR CONDITIONING, REFRIGERATION, PIPING, PLUMBING, AIR SANITATION, HEATING AND VENTILATION IN BUILDINGS

November, 1953

VOLUME 50—NO. 11

The Cover: The Procter and Gamble Research Building, described on page 63. Architect and Engineer, F. A. Fairbrother & Geo. H. Miehls; consultant, Albert Kahn Associated Architects & Engineers, Detroit.

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Washington News

LORING F. OVERMAN

SUPPOSE we could see behind the walls of the Kremlin as easily as Russia can see what goes on within the White House, the Capitol, and the Pentagon.

What if we were permitted to read headlines like the following from Russia:

"Modified Program for Handling Basic Metals in War About Ready."

"Defense Mobilizer Names Advisory Group to Study Manpower Needs."

"New BDSA Organization Unwrapped as Successor to NPA."

"Review of Expansion Goals Awaits Military Data."

"ODM Developing Program on Protective Construction."

"ODM Studying Wartime Transport Organization."

"Atomic Energy Chairman Urges Hydrogen Research on Vast Scale."

"Administration Not Trimming Costs At Expense of Defense."

"Air Force Plans Now Point Toward 127 Combat Wings."

If the foregoing headlines were written in Russian, outlining Russia's plans for the future, a thoughtful reader might conclude that a hot war must be just around the corner. As citizens of the United States, we can read such headline descriptions of our own preparations without feeling too alarmed, and we feel righteously indignant when others do not view them with equal complacency.

Who Fools Whom?

A most disturbing part about any speculation as to just how Iron Curtain countries feel about our headlines is that we cannot be certain whether they are believing us warlike, or whether they merely want us to continue believing that we must keep up our guard.

It is often suspected in Washington that the Kremlin is cleverly keeping us off balance economically by requiring us to spend for defense instead of for constructive purposes. Unfortunately, we cannot be sure, so it becomes necessary to take the middle course and plan for safety, just in case.

Taxes for Defense

As a result of uncertainty over the defense picture, the Administration is being required to revamp its entire strategy, taxwise. Instead of the budget-balancing, tax-slashing program promised just before election time, Washington planners are finding that defense is a stubborn monster with a voracious appetite. Its rations cannot be cut safely overnight, nor can warnings of such things as the H-Bomb be permitted to go unheeded.

So the tax folks are hurriedly trying to shore up the revenue losses which will take place when scheduled tax reductions take place January 1, and April 1. On the former date, individual income taxes are to drop by 10%, and the Excess Profits tax will expire. These reductions would lower revenues by $1.3 billion during the current fiscal year. The reductions would reach $7.4 billion in fiscal 1955 and $8 billion in 1956. Another $2 billion loss in revenue is involved in further reductions scheduled for April—reduction of corporate income taxes from 52% to 47%, and cutting of certain excise taxes.

Indications are that the January cuts will be permitted to stand, but the April changes may be countermanded. Not only that, but it is quite likely that new taxes will be levied—excise taxes over a greater number of items, a general manufacturers' excise tax, or—remotely possible—a federal retail sales tax.

Chances for excise taxes having an expanded base are considered more likely, for they promise to avoid the universal opposition that would be encountered in trying to pass either a federal sales tax or a manufacturers' general excise tax. Politically speaking, the expanded excise list would result in a few long and loud squawks from the items involved; then sullen, tax-paying silence.

Although it has not been suggested that air conditioning equipment be made a subject for special excise taxation, nothing is sacred when the tax hunt is on. Mentioned for possible inclusion in a new excise tax are clothing, furniture, rugs, other household furnishings, pipes, cigaret holders, motor boats, china, glassware, used cars, soft drinks, candy, gum and other low-priced items of general use. It is not difficult to picture the "household furnishings" classification being expanded to include several products of the heating, ventilating and air conditioning industries.

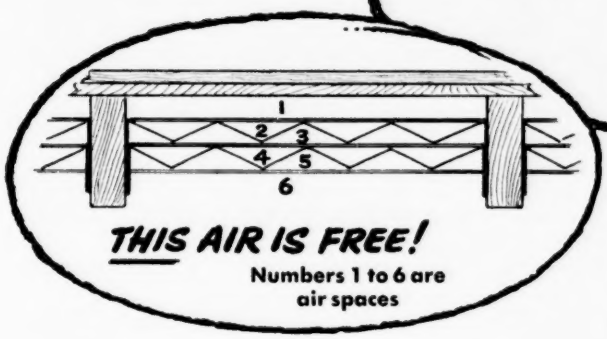
Best insurance against such taxes is to make certain that Members of Congress know constituents' viewpoints. Even then, it is not always possible to divert a threatened tax, particularly when such emergencies as H-bombs are pictured as the alternative.

Modified Controls Near

Ready to be announced about January 1 is a new modified controlled plan for handling steel, copper and aluminum "in the event of an all-out emergency." The plan would be similar to the Controlled Materials Plan which worked with reasonable success during World War II. It has been simplified materially, however, to shorten the time lag between gathering information on needs, and delivery of the metals to fill requirements. The new system seeks to speed the work of passing the allotment down the chain—perhaps to a small contractor whose product is needed long before final assembly of the finished weapon.

If the new materials control system is finally approved, it would become increasingly important to have accurate estimates of acceptable levels of production for both military and civilian end items for a stripped-down economy. This raises the question, long debated within Government, as to just how much in the way of statistics can be justified in peacetime. Washington planners are now hopeful that a sub-committee within the Census Department of the Department of Commerce, will become the repository for industrial mobilization data. As of now, reports on metals consumption are not required, and any new statistics collection plan will have to start from scratch.

WHO SAID AIR IS FREE?



THIS AIR IS FREE!

Numbers 1 to 6 are air spaces

Air is a good insulating medium. Were it not for Radiation and Convection, empty air spaces inside walls, roofs, etc. would be the best building insulation. But why pay costly labor, freight and storage bills for handling "free" air entrapped in bulky insulation **before** it is used? Bulky materials also require more freight cars, trailers and trucks. The "free" air is paid for over and over again.

Multiple accordion aluminum envelops large volumes of air **only** as it is opened when finally installed. This air is **really** free. Compartmentizing as it is stapled in place, the aluminum and fiber sheets **create** alternating layers of air spaces.

With respect to radiant heat flow, the aluminum sheets have 97% reflectivity, and 3% absorptivity and emissivity. Low conduction results from the preponderant air spaces of low density. The layers of multiple aluminum and fiber retard inner and outer convection. The thick, tough aluminum sheets are impervious to vapor flow. Infiltration under flat stapled flanges is slight. Condensation formation on or within is minimized by the scientific construction of multiple layers of joist-to-joist accordion aluminum, fiber, and air spaces.

Because of the low mass of unopened, practically airless multiple accordion aluminum, an ordinary passenger automobile will hold 20,000 sq. ft. of it without being or even looking overloaded. A standard railroad freight car, a huge interstate trailer, or a number of trucks would be needed to transport an equivalent amount of ordinary insulation.

A *new multiple accordion aluminum, Infra, Types 6-*Si*, and 4-*Si*, gives **complete** insulating coverage between beams and studs, forming a "blanket" of uniform thickness against heat and vapor flow, and condensation.

The American Society of Heating Ventilating Engineers has published a booklet which describes convection, conduction, and radiation heat flow through *ordinary* air spaces and what happens when an ordinary building space is lined or subdivided by reflective metals, thus creating reflective air spaces. Ask us for a copy – it's free.

*Patent applied for

COST OF INFRA INSULATION INSTALLED

in new construction between wood joists, material with labor,

Type 6-Si under 9½¢ sq. ft.
Type 4-Si under 7½¢ sq. ft.
Type 4-S Jr. under 7½¢ sq. ft.

Multiple accordion aluminum as it comes compactly from package contains very little air:—

As installed creates five additional layers of "free" air.

INFRA INSULATION, INC. V-11
525 Broadway, New York, N. Y.

☐ Please send ASHVE booklet "Insulating Effect of Successive Air Spaces Bounded by Bright Metallic Surfaces."
☐ Please send description of new Infra Insulation.
☐ Please send samples.

Name_____

Firm_____

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INFRA INSULATION, INC., 525 BROADWAY, NEW YORK, N. Y.

BDSA Succeeds NPA

How closely business is knit to defense is evidenced by Commerce Secretary Weeks' announcement of a new Business and Defense Services Administration. The new agency takes over the remaining functions of the National Production Authority; the Office of Technical Services, the Office of Distribution, the Commerce Department Field Services, staff functions of the Industry Evaluation Board, and the Office of Industry and Commerce, including its Trade Association, Commodity Standards, and Area Development Divisions.

The new BDSA will be under the authority of the Assistant Secretary of Commerce for Domestic Affairs. There will be an administrator, three assistant administrators, an assistant deputy administrator, and three BDSA staff offices—Office of Technical Services, Office of Small Business, and Office of Distribution.

In announcing the new agency, Secretary Weeks said that its primary responsibility will be the remaining defense and priority programs, and mobilization planning as directed by the Office of Defense Mobilization. Industry Advisory Committees of the National Production Authority will be continued by the BDSA. Mr. Weeks also hopes to organize a group of industry councils. These would deal with industry policy, while the Industry Advisory Committees would be concerned primarily with products.

Commerce Secretary Weeks has named Charles F. Honeywell as administrator of the new Business and Defense Services Administration. Four of Mr. Honeywell's top aides who have been sworn in are H. B. McCoy, career Commerce Department official, deputy BDSA administrator; H. J. Wallace, of Pittsburgh, on leave from his post as vice president in charge of sales of the National Tube Division, U. S. Steel Corp., assistant administrator; Walter A. Edwards, of Toledo, on loan from his post as assistant to the executive vice president, Owens-Illinois Glass Co., assistant administrator; Perrin G. March III, of Cincinnati, on loan from his position as president of the Cincinnati Shaper Co., and William E. Haines, assistant deputy administrator in charge of administration.

Standards Bureau Strengthening Urged

A Commerce Department Evaluation Committee of nine industrial, scientific and educational leaders has urged a strengthening of the National Bureau of Standards through restoration of personnel and additional funds, at least to the level of operations achieved in 1950.

In publishing the report, Secretary of Commerce Weeks commented that he is in full accord with the views of the scientists regarding the high level of importance of the bureau and of the need for strengthening it.

Manpower Needs

If a Muscovite or a satelliter should find the BDSA difficult to justify as an adjunct of peace, there might be further cause for alarm in the recent appointment of a 24-member Advisory Committee on Manpower Resources for National Security. The committee was formed for the specific purpose of assisting the Defense Mobilizer in preparing for the President a special report on how military manpower procurement policies and procedures affect the availability of manpower for other national security needs. The report is also to deal with the availability of manpower to operate a national security training program, while at the same time supplying military personnel for active service and for the civilian economy.

Defense Logistics Chartered

The newly appointed Assistant Secretary of Defense for Supply and Logistics — Charles S. Thomas — gave Washington newsmen a chart story of his department during a recent press conference. He said that his office has made substantial progress in awarding phantom contracts to manufacturers, providing them with notice that they will be asked to supply specific quantities of specific military items in the event of a national emergency. Advance notice of this type, he said, applies only to hard goods.

Mr. Thomas also revealed that work is going forward in assigning such military work to dual-purpose contractors, who have special skills or tools, or who make similar civilian products, and are especially suited to the production of needed military items. Mr. Thomas said he plans to recommend to Congress an orderly plan for going ahead with a single supply catalog on a continuing basis, rather than by means of an expensive program to rush the job to completion. Reduction of items from 4 million to 1½ million or less is probable, Mr. Thomas estimated.

Construction Record In Sight

Dollar value of construction may set a new record in 1953, according to Commerce and Labor Department predictions based on statistics through September. Expenditures for the month topped those of the previous September by 5%, for a total of $3.3 billion. The month's figure brings the total for the year to within $100 million of a previous government forecast of $26 billion. If fourth quarter spending reaches $8.7 billion, which seems likely, a new national record of $34.6 billion will have been established.

Private construction during September, at $2.2 billion, was down 1% from the previous month, but 8% higher than last September. For the first three quarters, private building spending totaled $17.4 billion, a rise of 9% over the first nine months of 1952.

Commercial construction rose to a new peak in September, and private outlays for public utility construction remained at the record August level. Private industrial construction, which normally rises in August and September, remained static.

Public construction was up 1% over August, but 1% below last September. For the first nine months of 1953, public building expenditures reached $8.4 billion, a gain of 5% over last year.

Nickel Control Lifted

Order M-80, which has tightly restricted the use of nickel in non-military production, has been revoked, effective November 1. Simultaneously, the ODM asked the Department of Commerce to issue a new order M-106, continuing controls over columbium and columbium-tantalum. Both had been covered by M-80. The basic steel order, N-1A, was also amended to remove restrictions on movement of nickel-bearing stainless steel.

These Dallas, Texas building records prove WROUGHT IRON PIPE lives up to its LONGER LIFE reputation

The pipe that lasts the longest costs the least.

"Which piping material will last the longest?"—that's the big question which faces everyone who has the say-so on piping for corrosive services. To find the *right* answer—essential in these days of rising maintenance and replacement charges—more and more cost-conscious planners are turning to *past service records* for their yardstick to selection.

How successfully Byers Wrought Iron pipe "measures up" when engineers and architects go after this how-long-does-it-last story is reflected in the increasing use of the material in every aspect of today's modern building.

Small wonder for this confidence!

Take these eight Dallas Buildings, for example. In each installation, wrought iron pipe is providing long life service at lower cost per year. And designers everywhere are finding similar wrought iron performance records.

If you are in doubt about pipe for some corrosive service, we'll be happy to show you past wrought iron service records to fit your particular problem. Just address your letter to our Engineering Service Department . . . your request will be handled promptly.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco. Export Division: New York, New York.

COMMERCIAL BUILDING
ERECTED—1899
SERVICES: Hot and cold water; steam supply and returns

PRAETORIAN BUILDING
ERECTED—1907
SERVICES: Hot, cold and drinking water lines

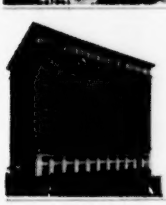
UNION TERMINAL BUILDING
ERECTED—1915
SERVICES: Hot, cold and drinking water lines; downspouts; steam supply and returns

FIRST NATIONAL BANK BUILDING
ERECTED—1917
SERVICES: Hot, cold and drinking water lines

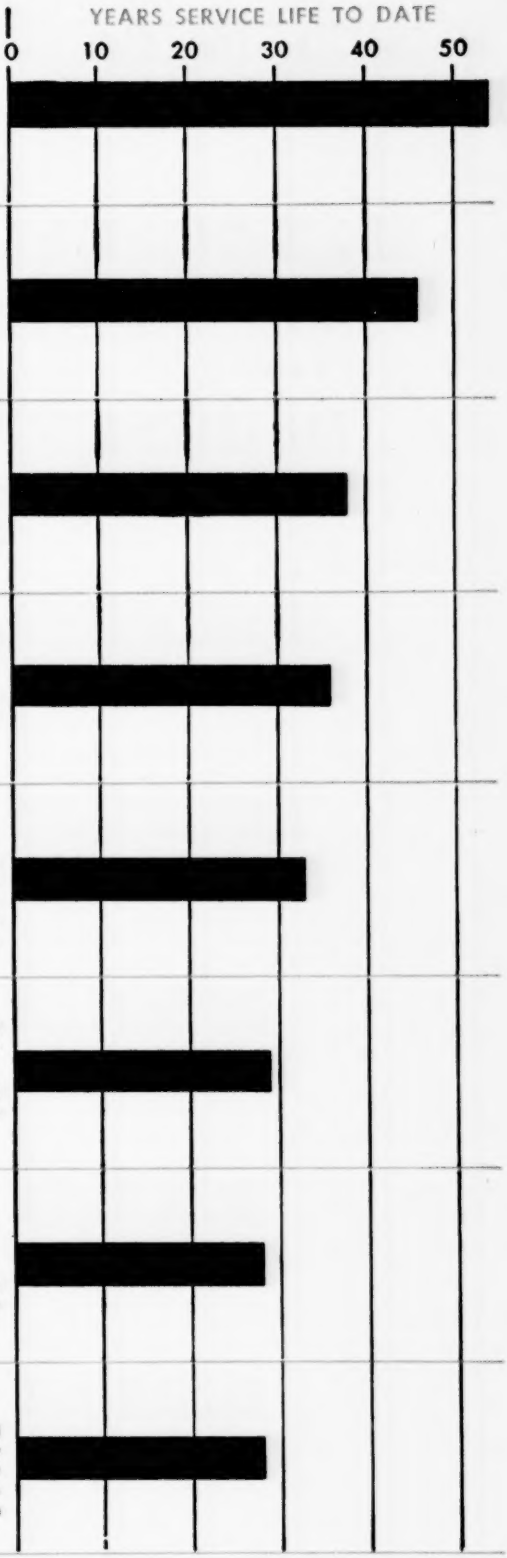
MAGNOLIA BUILDING
ERECTED—1920
SERVICES: Hot, cold and drinking water lines; Durham system drainage; fire lines; steam supply and returns

REPUBLIC NATIONAL BANK BUILDING
ERECTED—1924
SERVICES: Hot, cold and drinking water lines

COTTON EXCHANGE BUILDING
ERECTED—1925
SERVICES: Hot, cold and drinking water lines



BAKER HOTEL
ERECTED—1925
SERVICES: Hot, cold and drinking water lines; steam supply and returns; condenser water on air conditioning



BYERS

CORROSION COSTS YOU MORE THAN WROUGHT IRON

WROUGHT IRON

TUBULAR AND HOT ROLLED PRODUCTS

ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS

BRIEFLY STATED

• The C. A. Olsen Mfg. Co. announces the appointment of Edward R. Downe as vice president in charge of research and development. Mr. Downe has been with Olsen since 1943 in the capacity of chief engineer.

• Appointment of Ronald N. Campbell as assistant to the president was announced by Affiliated Gas Equipment, Inc., Cleveland, Ohio. In his new position, Mr. Campbell will coordinate and plan production. He comes to AGE after five years as vice president in charge of manufacturing for Landers, Frary & Clark, New Britain, Conn. Previously, Mr. Campbell was associated for more than 20 years with the Carrier Corp.

• The Westinghouse Electric Corp. recently announced plans to build a multi-million dollar ultra-modern packaged air conditioning plant near Staunton, Va. The new plant is part of the current $296 million Westinghouse expansion program to increase production by 50%.

• The appointments of Alwin B. Newton as chief design engineer and Ray W. Qualley as director of research are announced by The Coleman Company, Inc. Mr. Newton was recently vice president in charge of engineering of Acme Industries. For the past six years Mr. Qualley was in charge of all phases of engineering for Meyer Furnace Co., Peoria, Ill. He has also served with Chrysler Motors Corp. and Minneapolis-Honeywell Regulator Co.

• Robert M. Gordon has been appointed sales manager for The Torrington Manufacturing Co.'s Air Impeller Division in Torrington, Conn. Mr. Gordon joined Torrington as assistant sales manager in the Air Impeller Division last February following his resignation as a sales executive with the Milford Rivet and Machine Co., Milford, Conn.

• Plans for year 'round air conditioning of Monticello, Thomas Jefferson's home, were recently revealed by Worthington Corp., manufacturers of the air conditioning equipment for the installation. The proposed installation is unique in that it is not designed primarily for human comfort but to preserve the increasing number of Jeffersonian relics being placed in the building.

• Illinois Engineering Company, with headquarters in Chicago, on Nov. 2 became a wholly-owned subsidiary of American Air Filter Co., Louisville, Ky., and will henceforth be known as the Illinois Engineering Company Division of American Air Filter Company. Operations and personnel will carry on in Chicago and in the territories as in the past. C. A. Pickett will head up the Illinois Engineering Co. Division in Chicago. Prior to this, Mr. Pickett was Pacific regional manager for American Air Filter and prior to the purchase of Herman Nelson by American Air Filter Company, Mr. Pickett headed up a number of regional offices for Herman Nelson.

• Carrier Corporation will shortly have three major operating divisions, each of which will engineer, manufacture and market its own product lines. One of the operating groups will be the Unitary Equipment Division headed by John H. Holton, vice president and general manager. Carrier activities with respect to so-called heavy equipment will be assigned to the Machinery and Systems Division, which will be headed by George N. Lilygren, vice president and general manager. The responsibility of the third operating group, Allied Products Division, will include food freezers, unit heaters, automatic ice makers and certain other specialty products. J. L. Fletcher will be general manager of this division. All three operating divisions will be under the general supervision of William Bynum, executive vice president. In addition, the International Division and a central staff group will report to Mr. Bynum.

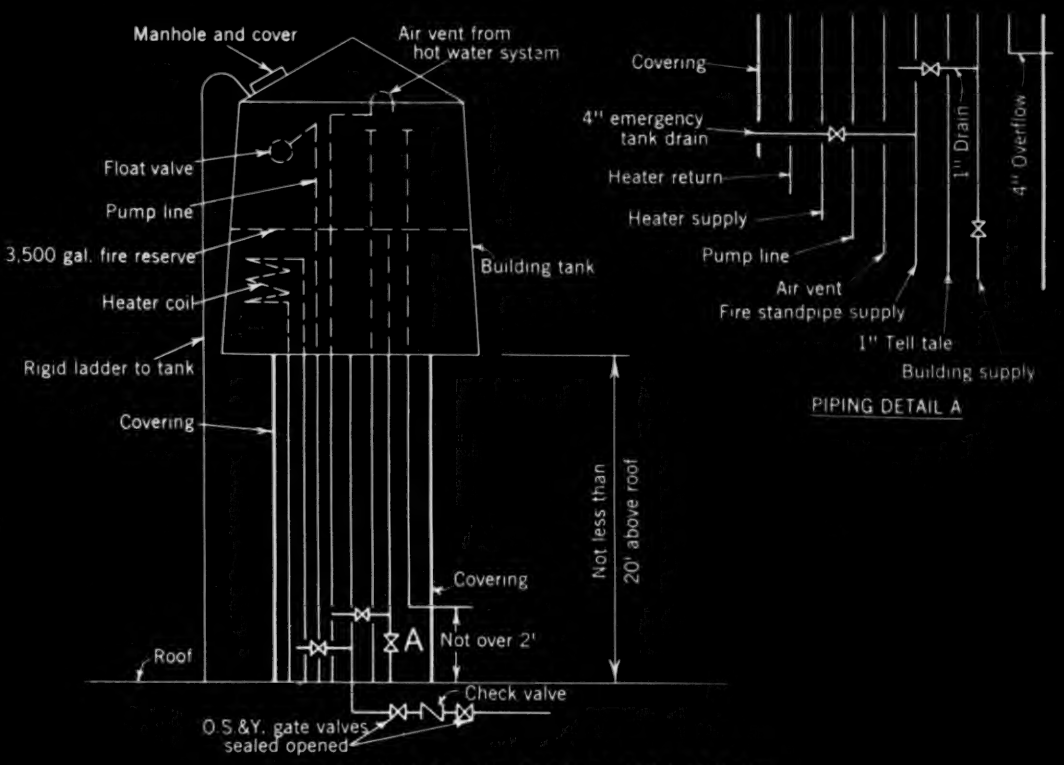
• Doremus L. Mills, development engineer who had been for more than twenty-five years with Revere Copper and Brass Incorporated, retired recently from that company and accepted a position as field representative with the Copper and Brass Research Institute. Mr. Mills received his MS from Pratt Institute of Science and Technology in 1907 and joined the Engineering Department of the Safety Car Heating and Lighting Co. that same year. In 1917, he was put in charge of the American Radiator Company's Architectural Department in New York City. In 1927, he became production engineer and liaison officer for the Rome Brass Radiator Corporation of New York. Shortly after he joined this company, it was merged in the formation of Revere, and Mr. Mills joined the Rome Radiation Department at the Rome Manufacturing Division. In 1938, he was made development engineer in Revere's Research and Development Department and was later placed in charge of the Pipe and Tube Section of Revere's Research Department. He has authored and co-authored many technical articles on the use of Revere pipe and tube products, particularly in the field of radiant heating.

• Robert P. Allison has been appointed manufacturing consultant to the General Electric Company's Weathertron Department. He will co-ordinate manufacturing facilities with product development. Mr. Allison has been with General Electric since 1935.

• J. C. Linsenmeyer has been elected president of American Blower Corp., a division of American Radiator and Standard Sanitary Corp. He succeeds the late Clark T. Morse, who died September 18 after a brief illness. Prior to his election, Mr. Linsenmeyer was vice president of manufacturing for American Blower. At the same time, John W. Brennan has been elected vice president of engineering. He formerly was chief engineer. Mr. Linsenmeyer became associated with American Blower as an air conditioning engineer in 1931. Mr. Brennan began his career as a sales engineer with American Blower in 1927, following his graduation from the University of Notre Dame.

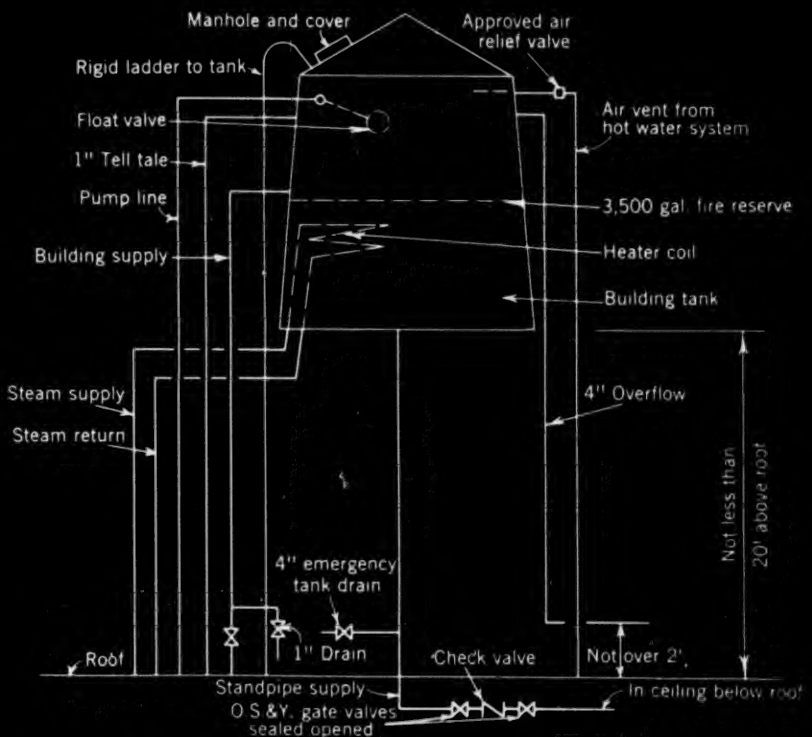
• The largest single installation of heat pumps on record will be made by General Electric Co. in a luxury motel in Miami Beach. A multiple installation of 49 Weathertrons, G.E.'s name for its heat pump, will provide all-electric year-round air conditioning in the Belmont Park Motel in Miami Beach.

PIPING CONNECTIONS FOR HOUSE TANKS



PIPING DETAIL A

BUILDING TANK WITH PIPE RUNS FROM BOTTOM

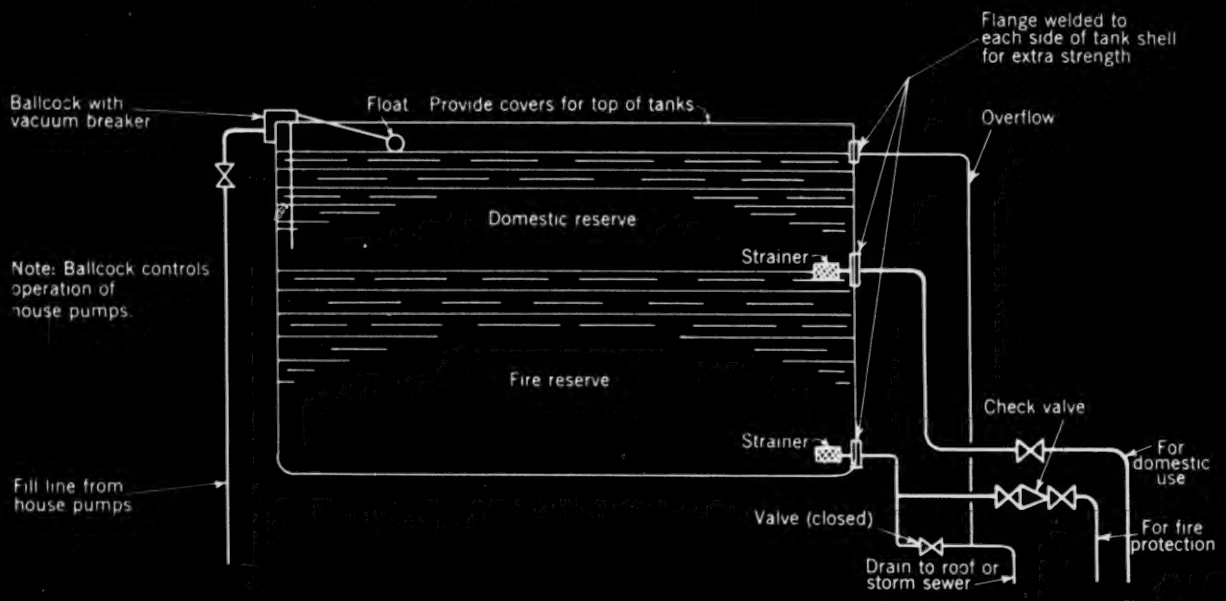


BUILDING TANK WITH PIPE RUNS AT SIDE

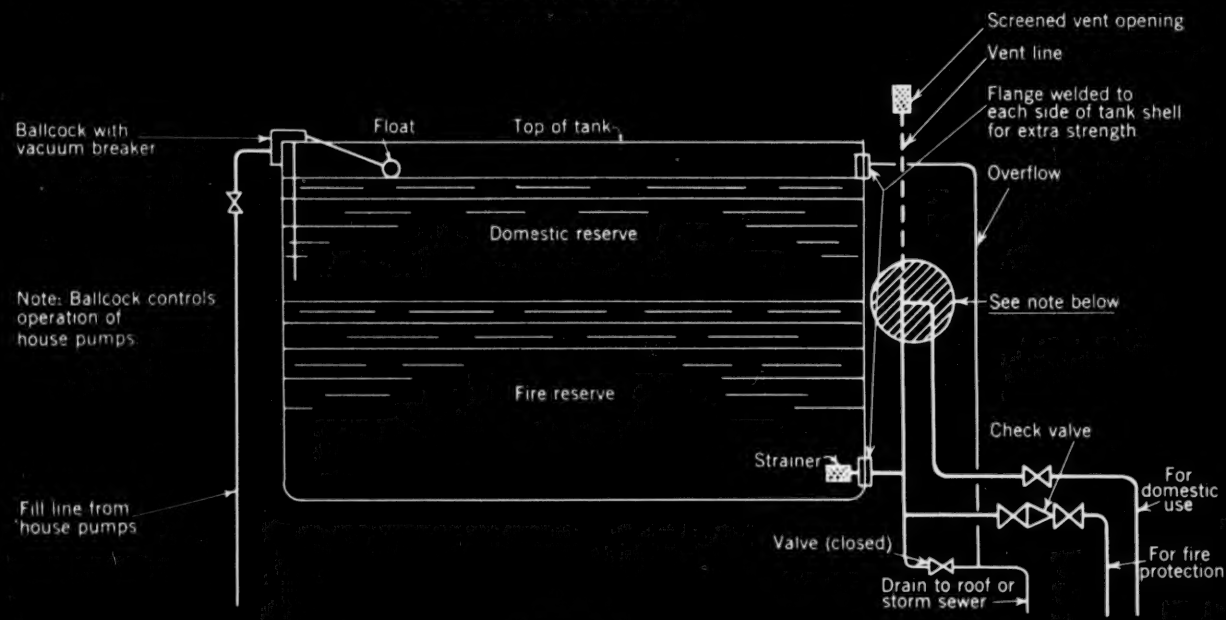
HEATING AND VENTILATING'S DETAIL SHEET

PIPING CONNECTIONS FOR HOUSE TANKS

TANKS ARE STEEL, USUALLY LOCATED IN HEATED AREA ON ROOF, AMOUNTS OF DOMESTIC RESERVE AND FIRE RESERVE DETERMINED BY INDIVIDUAL REQUIREMENTS AND UNDERWRITERS RULES; MINIMUM FIRE RESERVE IS 3500 GALLONS.



SCHEME I (generally used)



SCHEME II

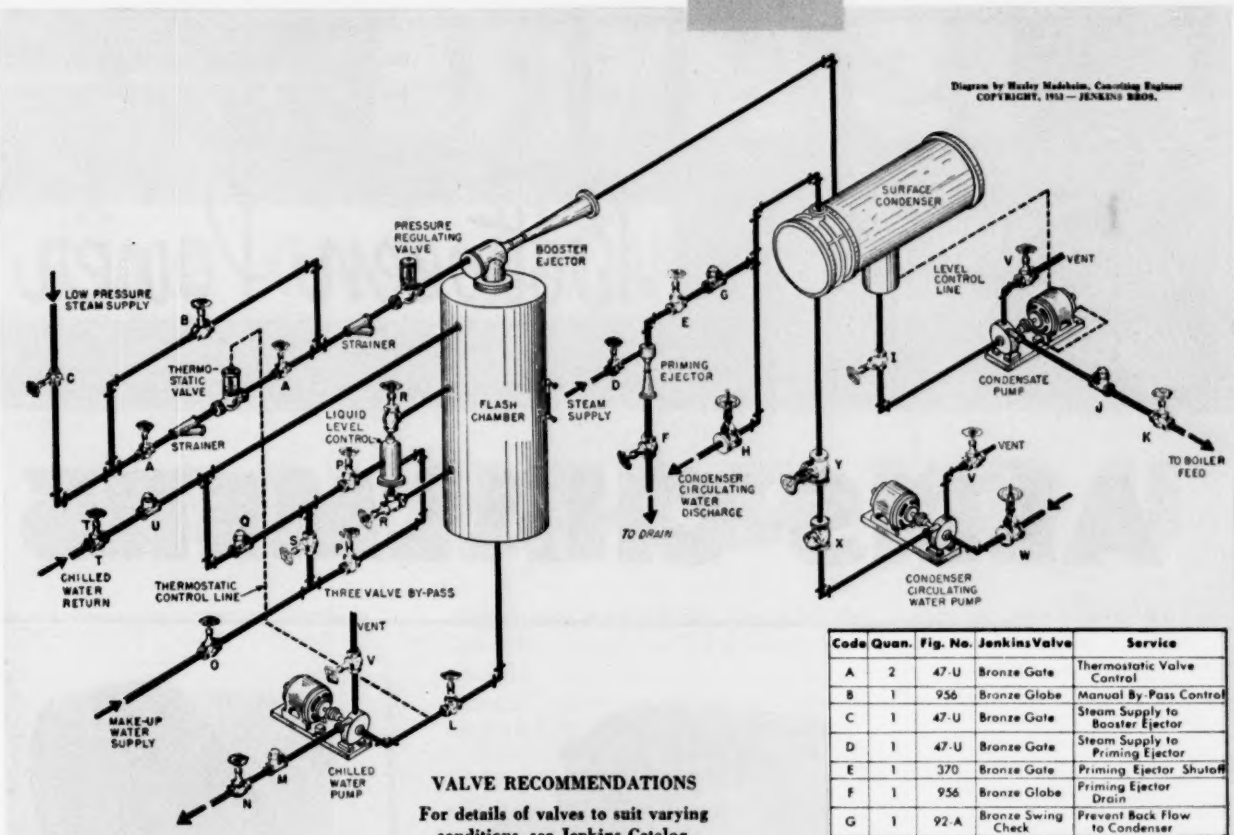
Scheme II is special because domestic water line is connected to fire line so that domestic reserve can be utilized without lowering fire reserve. And if needed entire domestic and fire reserve is available for fire protection. Advantage of this system is that since all water in tank is in motion it will remain clean and fresh.

In scheme I, only domestic reserve is in motion. The fire reserve within a short time will become stagnant and will affect the taste of the water unless tank is cleaned periodically.

PIPING DETAILS THROUGH THE COOPERATION OF
LOUIS BLENDERMANN, GLEN COVE, N.Y. AND WALTER C. KNIGHT, NEW YORK, N.Y.

HEATING AND VENTILATING'S DETAIL SHEET

JENKINS PRACTICAL PIPING LAYOUTS 69



VALVE RECOMMENDATIONS

For details of valves to suit varying conditions, see Jenkins Catalog.

Code	Quan.	Fig. No.	Jenkins Valve	Service
A	2	47-U	Bronze Gate	Thermostatic Valve Control
B	1	956	Bronze Globe	Manual By-Pass Control
C	1	47-U	Bronze Gate	Steam Supply to Booster Ejector
D	1	47-U	Bronze Gate	Steam Supply to Priming Ejector
E	1	370	Bronze Gate	Priming Ejector Shutoff
F	1	956	Bronze Globe	Priming Ejector Drain
G	1	92-A	Bronze Swing Check	Prevent Back Flow to Condenser
H	1	651-A	I.B.B.M. Gate	Cooling Water Discharge Shutoff
I	1	370	Bronze Gate	Condensate Pump Shutdown
J	1	92-A	Bronze Swing Check	Prevent Backflow through Condensate Pump
K	1	106-A	Bronze Globe	Condensate Pump Control
L	1	370	Bronze Gate	Chilled Water Pump Shutdown
M	1	92-A	Bronze Swing Check	Prevent Back Flow Through Pump
N	1	106-A	Bronze Globe	Chilled Water Pump Control
O	1	106-A	Bronze Globe	Make-up Water Control
P	2	370	Bronze Gate	Automatic Valve By-Pass
Q	1	92-A	Bronze Swing Check	Prevent Backflow from Chamber
R	2	108-A	Bronze Angle	Level Control Shutoff
S	1	106-A	Bronze Globe	Manual By-Pass Control
T	1	106-A	Bronze Globe	Chilled Water Control
U	1	92-A	Bronze Swing Check	Prevent Backflow Chilled Water Lines
V	1	106-A	Bronze Globe	Pump Vent
W	1	651-A	I.B.B.M. Gate	Condensing Water Pump Shutdown
X	1	624	I.B.B.M. Swing Check	Prevent Backflow to Pump
Y	1	613	I.B.B.M. Globe	Pump Control

How to plan a

STEAM JET REFRIGERATION SYSTEM

The use of steam for air conditioning has increased steadily during the past few years, principally because of the low cost of steam. In plants generating their own steam, demands on the boiler plant are greatly reduced during the summer months, while plants having to purchase district steam usually benefit by reduced summer rates.

In the steam jet system shown, water returned from the chilled water coils of the air conditioning system enters the flash chamber which is maintained at a low pressure by the booster ejector. Here the water is cooled to a temperature corresponding to the boiling point at the reduced pressure. Heat is removed by the flashing of a portion of the returned water to steam which is removed by the ejector.

The booster ejector used in this system requires either a barometric or surface condenser. Pump drives may be either electric or steam turbine, depending upon local operating costs and the size of the installation.

Consultation with accredited piping engineers and contractors is recommended when planning any major piping installation.

To save time, to simplify planning, to get all the advantages of Jenkins specialized valve engineering experience, select all the valves you need from the complete Jenkins line. It's your best assurance of *lowest cost in the long run*. Jenkins Bros., 100 Park Ave., New York 17.

• •

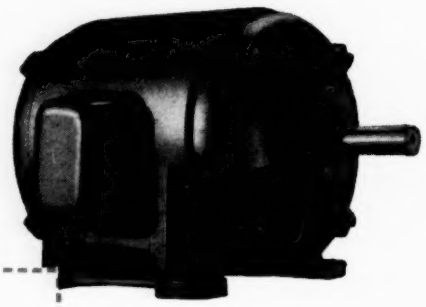
Complete description and enlarged diagram of this layout free on request. Includes additional detailed information. Simply ask for Piping Layout No. 69.

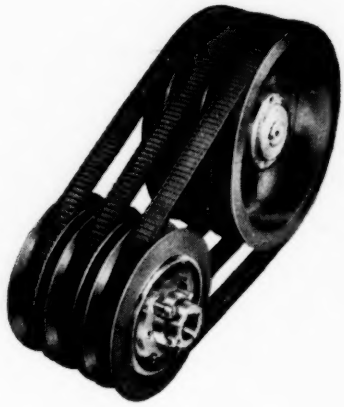
JENKINS VALVES
LOOK FOR THE DIAMOND MARK
SINCE 1864
Jenkins Bros
SOLD THROUGH LEADING INDUSTRIAL DISTRIBUTORS EVERYWHERE

If Your Problem IS HERE

Between Power

ALLIS-CHALMERS





SEND COUPON

Allis-Chalmers Mfg. Company
Milwaukee 1, Wisconsin

Please send me more information on Allis-Chalmers coordinated equipment.

- ☐ Motors — Bulletin 52B6052
- ☐ Control — Bulletin 14B7132
- ☐ *Texrope* V-belt Drives — Bulletin 20B6051

Name .....

Title .....

Company .....

Address .....

City and State .....

A-3904

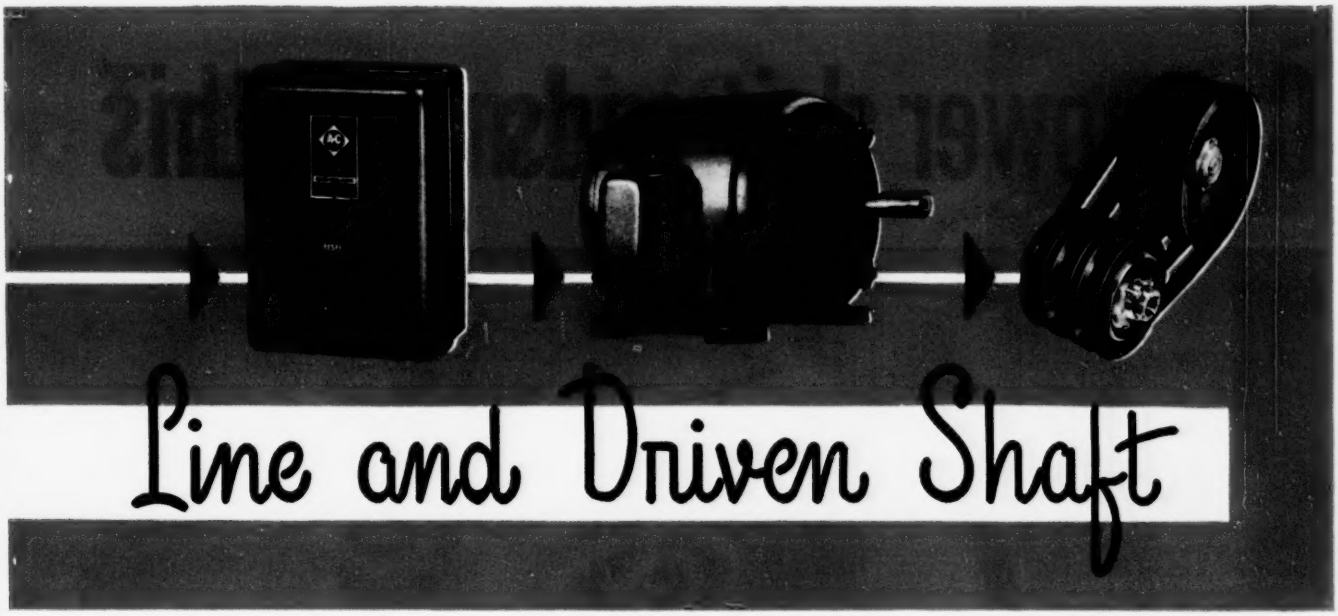
Motors Smooth running and quiet operating. Cast iron frames resist corrosion in humid atmospheres. Double shielded bearings do not ordinarily require lubrication but may be lubricated in service if desired. Sleeve bearing motors available in many sizes if required.

Sizes from ½ hp up. Types include single and multi-speed squirrel-cage, dc, wound-rotor and synchronous. Enclosures include drip-proof, splash-proof, totally-enclosed, non-ventilated, totally-enclosed fan-cooled and explosion-proof. Totally-enclosed and explosion-proof motors built in famous finned design which greatly reduces cleaning problems and costs, or in the tube-cooled design which gives the same maintenance savings in the larger sizes.

TEXROPE Drives — The original multiple V-belt drive and the most complete line of V-belt drive products in the industry. *Super-7* V-belts feature grommet construction in all but the smallest sizes. Also available in high-capacity, oil-resisting, static-conducting type.

Variable speed sheaves for fans and pumps provide a simple, inexpensive method of controlling output. Saves time in balancing systems, simplifies seasonal adjustments. Allis-Chalmers variable speed sheaves include *Vari-Pitch* sheaves for stationary or motion control with both standard and wide range adjustments.

Constant speed sheaves include *Texsteel* sheaves and *Magic-Grip* easy mounting sheaves in a complete range of sizes.



Line and Driven Shaft

CAN HELP YOU

Control— There is an Allis-Chalmers control to meet every requirement of motor operation through the complete range of motor sizes. Manual and magnetic, reversing and non-reversing, across-the-line and reduced voltage starters are included. Push button and pilot devices are available in any number of positions and in all combinations. Accessory Allis-Chalmers control equipment includes dc contactors, timing relays, contactors for heavy duty starting and rotary control switches.

YOU CAN SAVE TIME, SAVE WORK, SAVE MONEY and be sure of your fan, pump and compressor drives when you use coordinated components from Allis-Chalmers. For Allis-Chalmers can supply you with control, motor and *Texrope* V-belt drive for your machine . . . all of integrated design and manufacture.

Unit Responsibility

By using Allis-Chalmers coordinated drive components, you save paperwork and the time and cost of matching parts from different sources. More important, you know the components will fit together properly . . . that assembly will be completed quickly and easily.

And you don't have to worry about passing the buck on service. Allis-Chalmers stands behind the complete drive and takes responsibility for the proper functioning of every part.

Delivery from Stock

Immediate delivery from stock can be had on nearly all standard items from warehouses and distributor stocks located all over the country.

Allis-Chalmers representatives are experienced in air conditioning problems and can give you the kind of help you need in selecting the best drive for your machine. And this team of field experts is backed up by a large factory engineering staff.

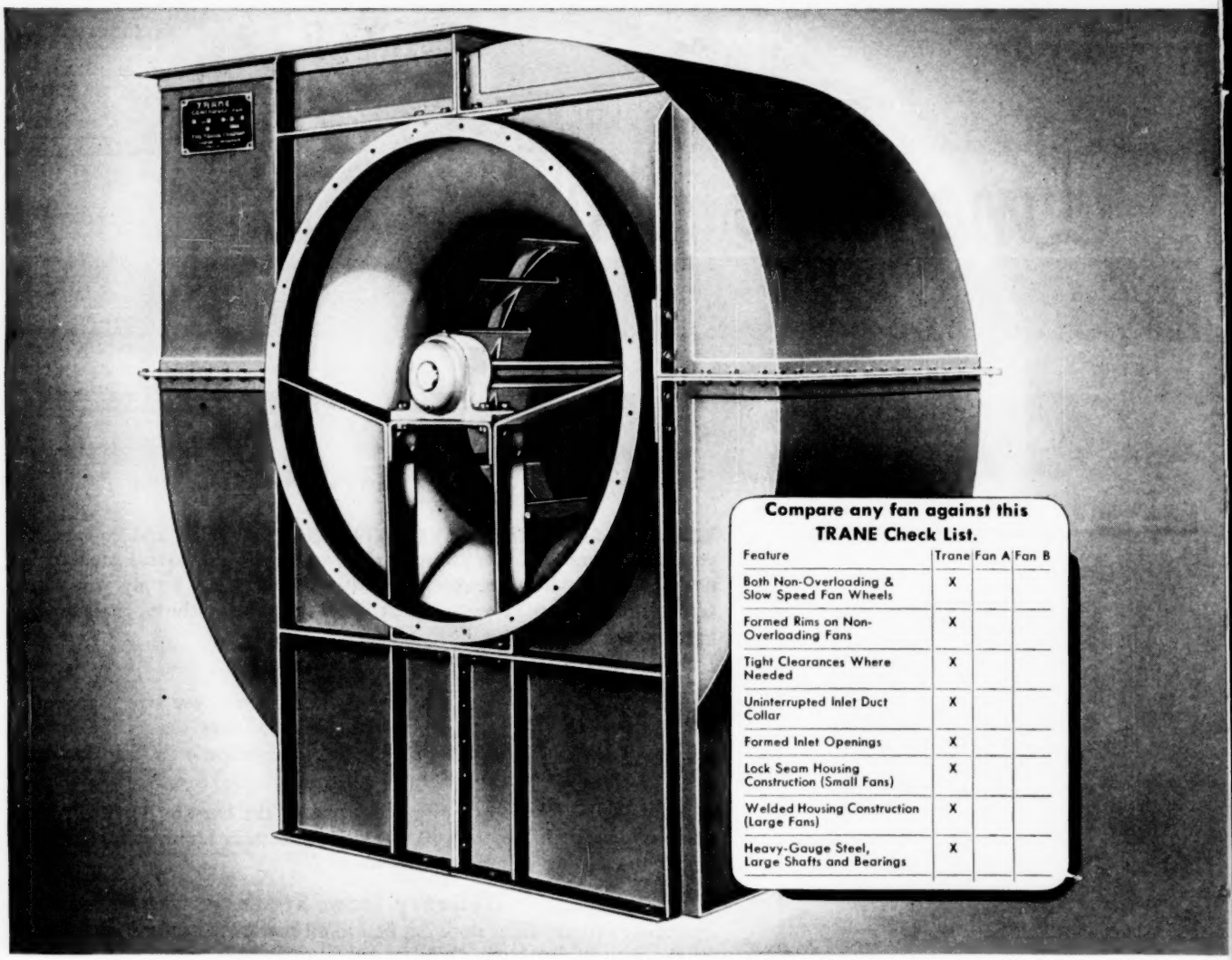
Certified Service

Allis-Chalmers continues to serve you after the sale with nearly a hundred Certified Service Shops located in every industrial area in the country. Allis-Chalmers Certified Service Shops are carefully selected independent service shops that use only factory-approved parts and methods in complete servicing of Allis-Chalmers equipment.

Texrope, Texsteel, Magic-Grip, Vari-Pitch, and Super-7 are Allis-Chalmers trademarks.

ALLIS-CHALMERS

Cut power demands with this



Compare any fan against this TRANE Check List.

Feature	Trane	Fan A	Fan B
Both Non-Overloading & Slow Speed Fan Wheels	X		
Formed Rims on Non-Overloading Fans	X		
Tight Clearances Where Needed	X		
Uninterrupted Inlet Duct Collar	X		
Formed Inlet Openings	X		
Lock Seam Housing Construction (Small Fans)	X		
Welded Housing Construction (Large Fans)	X		
Heavy-Gauge Steel, Large Shafts and Bearings	X		

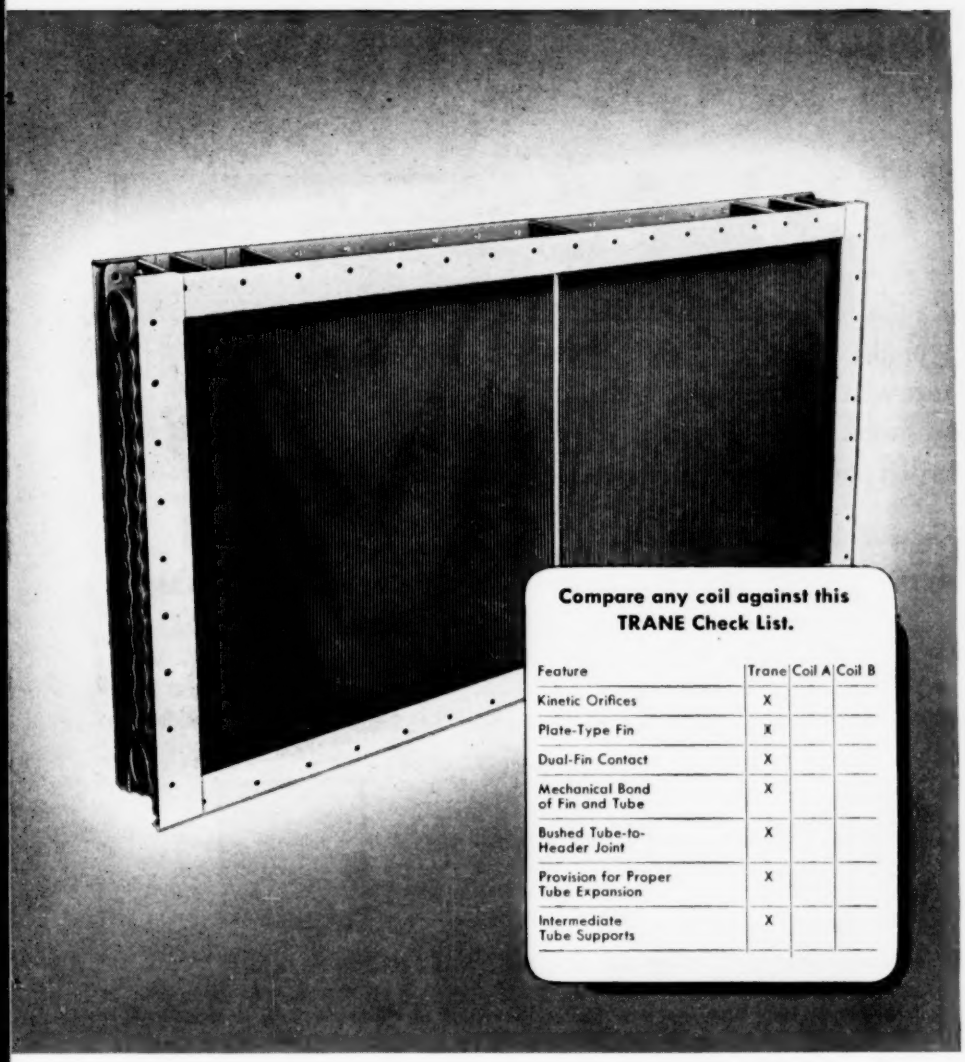
Together, TRANE Centrifugal Fans and TRANE Coils create a central system that produces top performance with less horsepower. Here's why:

Average horsepower requirements of TRANE Fans are unusually low. TRANE Coils, with their plate type fins, offer minimum resistance to air flow. Combine a low horsepower fan with a low air friction coil and power demands shrink accordingly. You get greater efficiency and lower operating costs.

Four of the fifteen reasons why TRANE Fans and Coils give top performance with less horsepower are illustrated on next page. For more complete data, contact your nearest TRANE office or write direct. The TRANE Company, La Crosse, Wis.

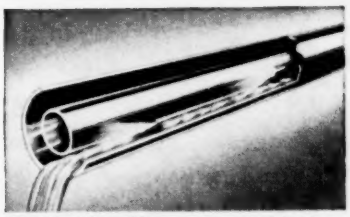
MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING AND VENTILATING EQUIPMENT

Trane combination

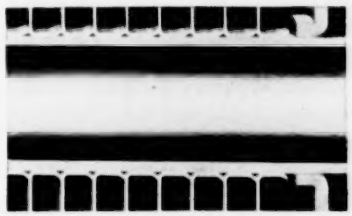


Compare any coil against this TRANE Check List.

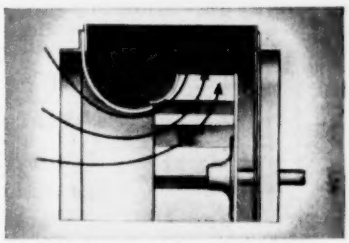
Feature	Trane	Coil A	Coil B
Kinetic Orifices	X		
Plate-Type Fin	X		
Dual-Fin Contact	X		
Mechanical Bond of Fin and Tube	X		
Bushed Tube-to-Header Joint	X		
Provision for Proper Tube Expansion	X		
Intermediate Tube Supports	X		



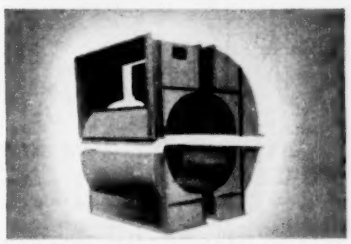
The kinetic orifice, a patented feature of TRANE Type SD Coils, releases steam in the direction of the condensate flow. Drainage of condensate is accelerated. Designed to eliminate temperature stratification and freezing.



Permanent mechanical fin-to-tube bond is as strong as though the fin and tube were one. The wide, flat fin collar produces a generous heat transfer area. Collar of one fin is extended to next fin to form uninterrupted surface for continuous flow of heat.



Accurately streamlined fan inlet cone makes possible even distribution of air in the fan wheel without noisy turbulence. Permits fan to operate at highest efficiency with lowest noise level.



Split fan housing permits easier installation. On large units, housings can be split on horizontal and vertical plane so fan parts can be moved through small openings and reassembled.

Get top performance from less horsepower with

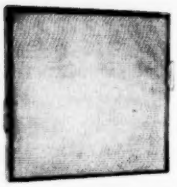
TRANE Fans · Coils

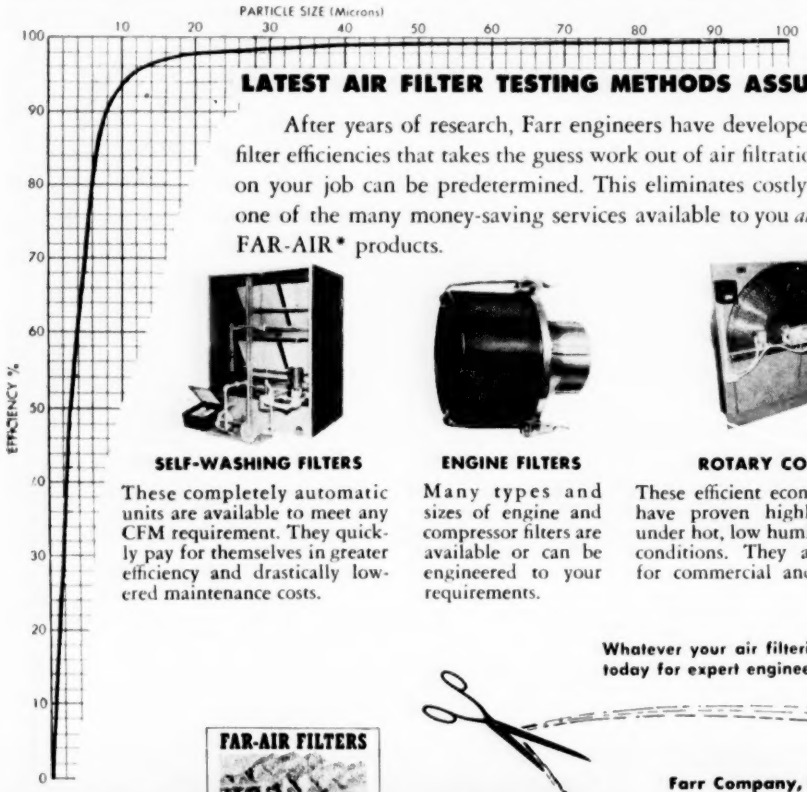
The Trane Company, La Crosse, Wis. • East. Mfg. Div., Scranton, Penn. • Trane Co. of Canada, Ltd., Toronto • 87 U.S. and 14 Canadian Offices

YOURS FREE!

Farr Company Offers a Competent Staff of Field Engineers Plus Laboratory Services to Assist You with Your Air Filtration Problems

Selection of the proper air filters to meet your exact needs is most important. For this reason, Farr Company maintains competent field and laboratory engineers who are well qualified to determine the best type of filter needed to solve your particular problem. This free service can be invaluable to you in guaranteeing complete satisfaction with your air handling system.





LATEST AIR FILTER TESTING METHODS ASSURE YOU OF PEAK PERFORMANCE

After years of research, Farr engineers have developed a radically improved method of measuring filter efficiencies that takes the guess work out of air filtration. Now, for the first time, filter performance on your job can be predetermined. This eliminates costly mistakes and needless expense. This is just one of the many money-saving services available to you *at no cost*. Write today for full information on FAR-AIR* products.

SELF-WASHING FILTERS

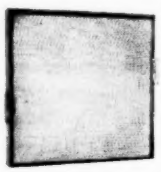
These completely automatic units are available to meet any CFM requirement. They quickly pay for themselves in greater efficiency and drastically lowered maintenance costs.

ENGINE FILTERS

Many types and sizes of engine and compressor filters are available or can be engineered to your requirements.

ROTARY COOLERS

These efficient economical units have proven highly successful under hot, low humidity climatic conditions. They are available for commercial and home use.



PANEL FILTERS

FAR-AIR panel filters are available in many types and sizes. Each design has been engineered for peak performance and substantial economy over ordinary types.

Whatever your air filtering problem is, it will pay you to mail the coupon today for expert engineering assistance. Remember, this is a FREE SERVICE!

FARR COMPANY

Manufacturing Engineers

Chicago • Los Angeles • New York

Made under license by Control Equipment Co. Ltd. Montreal, Canada

Farr Company, P. O. Box 10187, Airport Station
Los Angeles 45, California

Gentlemen: Send me complete information on FAR-AIR products. I would ☐ would not ☐ require engineering assistance.

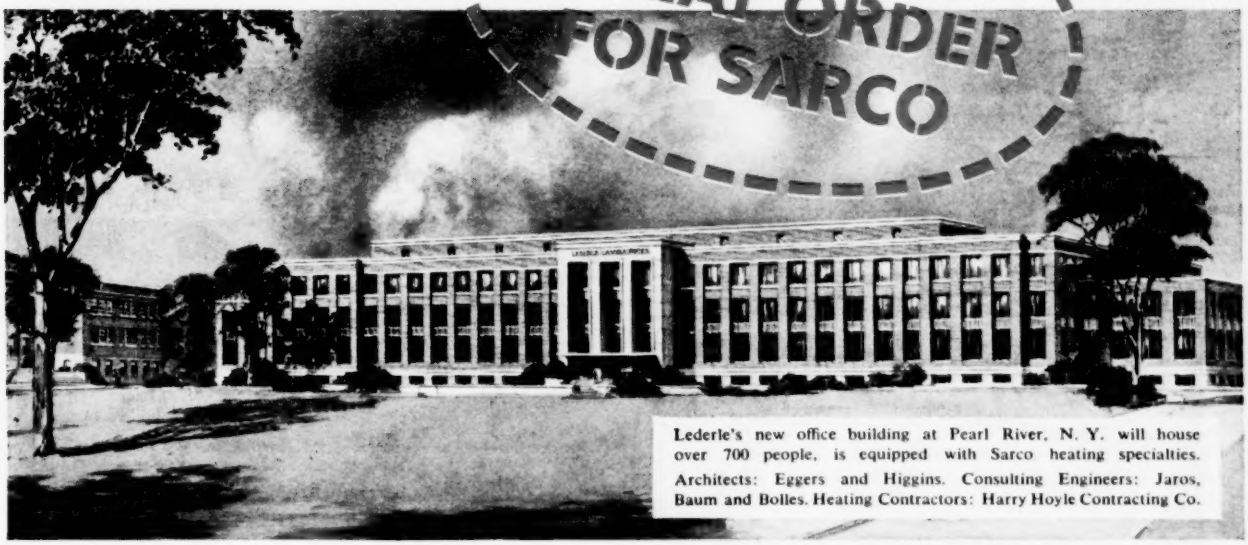
NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

The most convincing stamp of user satisfaction

ANOTHER REPEAT ORDER FOR SARCO



Lederle's new office building at Pearl River, N. Y. will house over 700 people, is equipped with Sarco heating specialties. Architects: Eggers and Higgins. Consulting Engineers: Jaros, Baum and Bolles. Heating Contractors: Harry Hoyle Contracting Co.

18 years of repeat orders *and now again . . .*

Lederle Laboratories Division American Cyanamid Co. Installs Sarco Heating Specialties

There's a good reason why Sarco Heating Specialties have been specified and used by Lederle again and again.

That reason is Sarco dependability.

Leading architects, engineers and contractors know from the long record of repeated user approval that they can depend on Sarco performance.

The Sarco heating specialties now operating in this new office building and other Lederle Laboratories buildings have been installed over a period of 18 years. Several thousand Sarco steam traps, radiator valves and traps, air eliminators, strainers, and temperature controls are giving satisfactory performance.

For dependable heating specialties and all around satisfaction, you can confidently specify Sarco.

On your request, we'd be happy to send you full information on Sarco's complete line.

FOUR REASONS WHY IT PAYS TO SPECIFY SARCO

1. Proven Dependability
2. Trouble-free Service
3. Complete Line from One Reliable Manufacturer
4. Nationally Known and Preferred by Users.

SARCO SAVES STEAM

SARCO COMPANY, INC., Empire State Building, New York 1, N. Y.

Sarco Canada, Ltd., Toronto 8, Ontario . . . Represented in Principal Cities

STEAM TRAPS • TEMPERATURE CONTROLS • HEATING SPECIALTIES

Radiator Valves • Traps

Strainers

Float-Thermostatic Traps

Inverted Bucket Traps

Thermostatic Traps

Water Blenders

Air Eliminators

Dial Thermometers

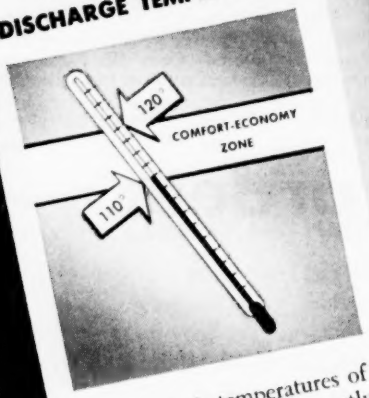
Self-Operated Temp. Reg.

Before you buy any unit heater

Compare

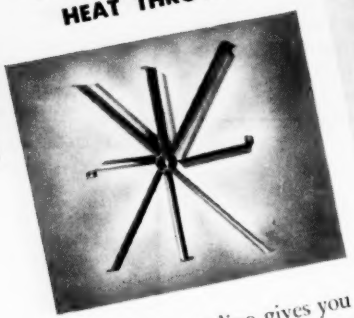
MODINE STEAM and HOT WATER units that top the field

Compare
DISCHARGE TEMPERATURES



Discharge air temperatures of 110° to 120° F. are correctly related to air velocities — the key to perfect heating comfort plus lower fuel costs.

Compare
HEAT THROW



No one but Modine gives you a built-in velocity generator that effectively steps up heat throw, assures positive heat penetration of cold air strata near floor.

In addition to horizontal delivery models, Modine offers a new line of vertical units for both steam and hot water. New, improved design is lighter, smaller, yet gives you *greater* capacity.

Compare LONG LIFE

Modine's advanced engineering is combined with superb styling and highest grade materials. Your assurance of long years of trouble-free service. *But see for yourself!* Call the Modine representative listed in your phone book, or write for Bulletin 153 on Modine Steam and Hot Water Unit Heaters.

Modine

...steam, hot water or gas...

Modine WITH ALL OTHERS!

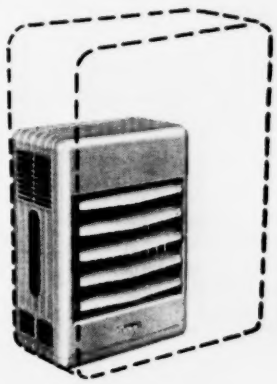
Modine Gas-Fired Unit Heaters are built in a full range of popular sizes. All are A.G.A.-approved for natural, mixed, manufactured, L.P. and L.P.-air gases.

GAS-FIRED units that top the field . . . with *stainless steel* heat exchangers and burners

Compare

EASE OF INSTALLATION

Advanced stainless design makes Modines 50% lighter in weight—more compact than the average of seven other leading makes. Installation is faster, easier — no need for special structural supports. On one job, it cost the heating contractor $600 less to install 66 Modines than conventional units — savings he passed on to the owner.



Compare

PERFORMANCE

EVEN HEATING | MODINE | CONVENTIONAL

Not only do Modine units resist corrosion — all tubes heat uniformly because they're individually fired. Burners have elongated ports with four times the free area of ordinary drilled ports for maximum combustion efficiency. Remember: with Modines you are *sure* of getting full rated capacity.

U-1202

Compare ALL-AROUND VALUES

As the leader in the development and application of steam and hot water unit heaters for more than 25 years, Modine brings unequalled experience to gas unit heating problems. It is the *only* manufacturer to publish heat throw data for gas-fired units. For facts, ask for Bulletin 653. Modine Mfg. Co., 1511 DeKoven Avenue, Racine, Wisconsin.

UNIT HEATERS

CLEAN EDGES WITH A GOOD CUTTER-BUT CLEAN JOBS DEPEND ON

GOOD PIPE

ON the job or in the shop, you like to work with Youngstown pipe. Cutting is clean, fast and easy because Youngstown pipe is uniformly round and soft—true to size, even in grain structure, free of inclusions and hard spots. The name "Youngstown", rolled into every length, means GOOD PIPE.

QUALITY YOUNGSTOWN SERVICE

7 POINTS OF UNIFORM GOODNESS IN
YOUNGSTOWN STEEL PIPE

uniform ductility - - uniform lengths - - uniform threading - - uniform weldability - - uniform wall thickness and size - - uniform strength and toughness - - uniform roundness and straightness

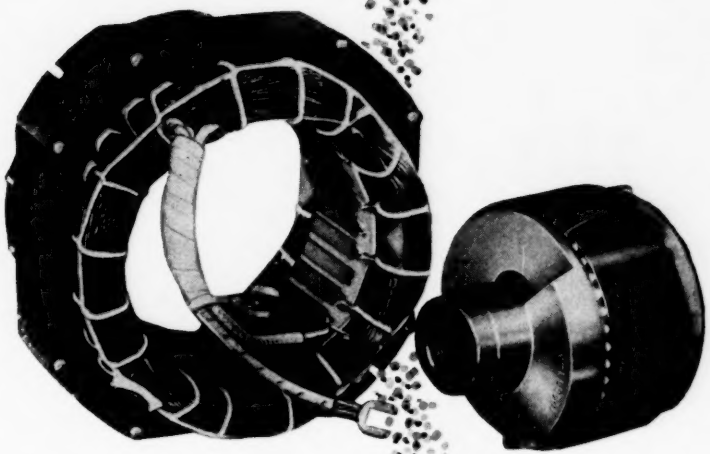
Youngstown STEEL PIPE

THE YOUNGSTOWN SHEET AND TUBE COMPANY
General Offices: Youngstown, Ohio - Export Office: 500 Fifth Avenue, New York 36, N. Y.
PIPE AND TUBULAR PRODUCTS - CONDUIT - BARS - RODS - COLD FINISHED CARBON AND ALLOY BARS - SHEETS - PLATES - WIRE - ELECTROLYTIC TIN PLATE - COKE TIN PLATE - RAILROAD TRACK SPIKES

lonesome part of a popular product

The hermetic motor—that part of a modern refrigerating unit the user *never* sees—is truly "out of sight . . . out of mind."

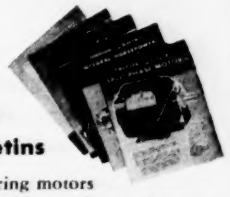
And the fact that it is forgotten is a tribute to its design and construction, for here is a motor that must always function perfectly, while permanently enclosed in the compressor housing. *The "forgotten" part of many of America's most dependable refrigeration units is an Emerson-Electric Hermetic Motor.*



You can benefit from Emerson-Electric's 63 years of experience in motor design and production. If you have requirements in ratings from 1/20 to 5 h.p., or hermetic motors from ⅛ to 20 h.p., Emerson-Electric has the right motor for you. Your inquiry is invited.

THE EMERSON ELECTRIC MFG., CO.
St. Louis 21, Mo.

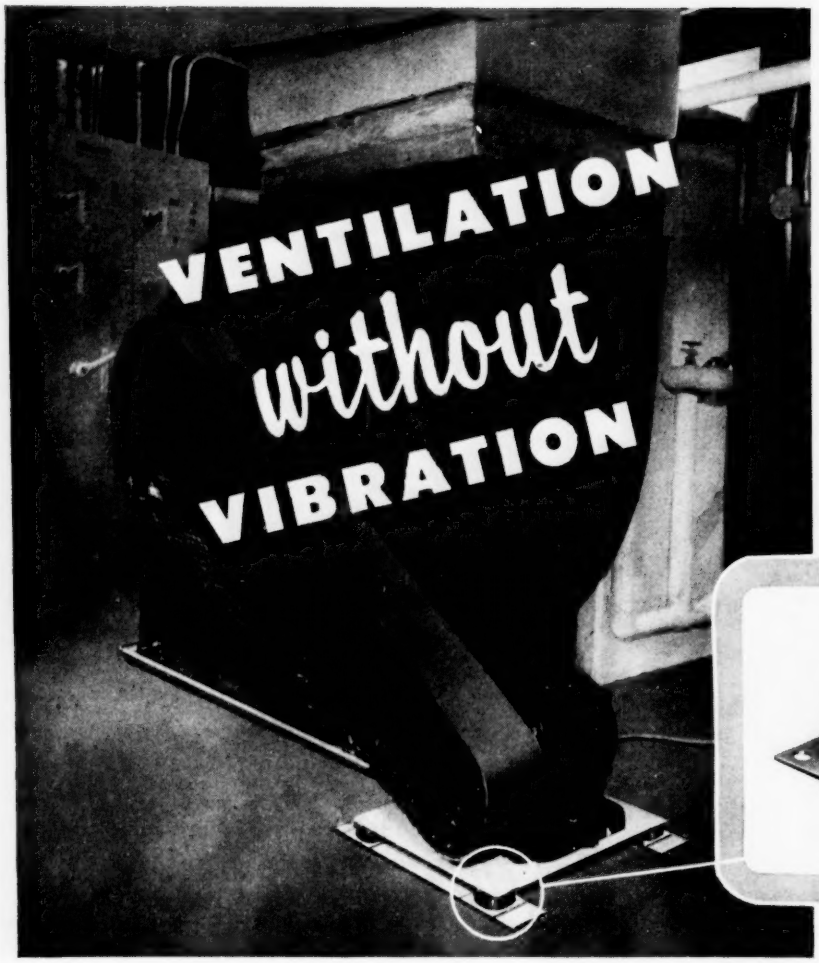
Write for these Emerson-Electric Motor Data Bulletins



Manufacturers requiring motors 1/20 to 5 h.p. can profitably use these reference guides. Specifications, construction and performance data are included for these motors:

- ☐ 452-A Capacitor-Start
- ☐ 452-B Split-Phase
- ☐ 452-C Integral
- ☐ 452-D Fan-Duty
- ☐ 452-E Oil-Burner
- ☐ 452-F Jet Pump
- ☐ 452-G Blower

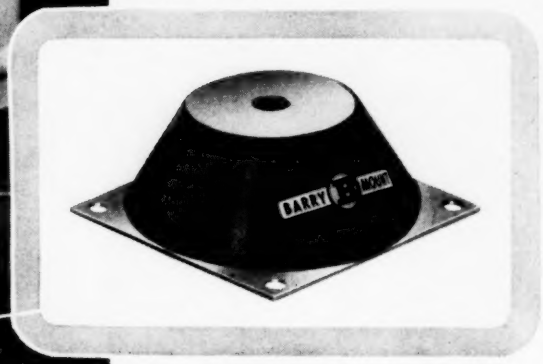
EMERSON ELECTRIC
MOTORS • FANS APPLIANCES



The new Barry fan bases are designed to achieve maximum efficiency in reducing noise and vibration transmitted from heating and ventilating fans and air-conditioning units.

They are engineered by The Barry Corporation, leaders in the field of vibration-isolating equipment for military use, to apply the most up-to-date knowledge to this problem.

Their detailed design is completed for each particular installation *to meet the exact requirements of that installation*, because this is the only way to assure *maximum performance*.



Noise and vibration from heavy motor-driven blowers proceed partly through the air, from the fan blades and other moving parts of the machinery, and partly by transmission through the building structure from the supporting base.

The key to effective reduction of both vibration and audible noise is a properly-designed isolating support, specifically engineered to take account of the weight of the fan and its motor and housing, the location of the center of gravity, and the operating speed. Barry fan bases achieve maximum efficiency by careful attention to all these factors.

These fan bases incorporate an isolating element of new design, in an integral structure of rails and motor base to fit your exact needs. They are manufactured to your own specifications, custom-built to bring you full satisfaction in actual performance. Write to us today, or get in touch with our nearest representative, so that we may place our experience at your service.

THE **BARRY** CORP.

712 PLEASANT ST., WATERTOWN 72, MASSACHUSETTS

SALES REPRESENTATIVES IN

Atlanta Baltimore Chicago Cleveland Dallas Dayton Detroit Los Angeles Minneapolis New York
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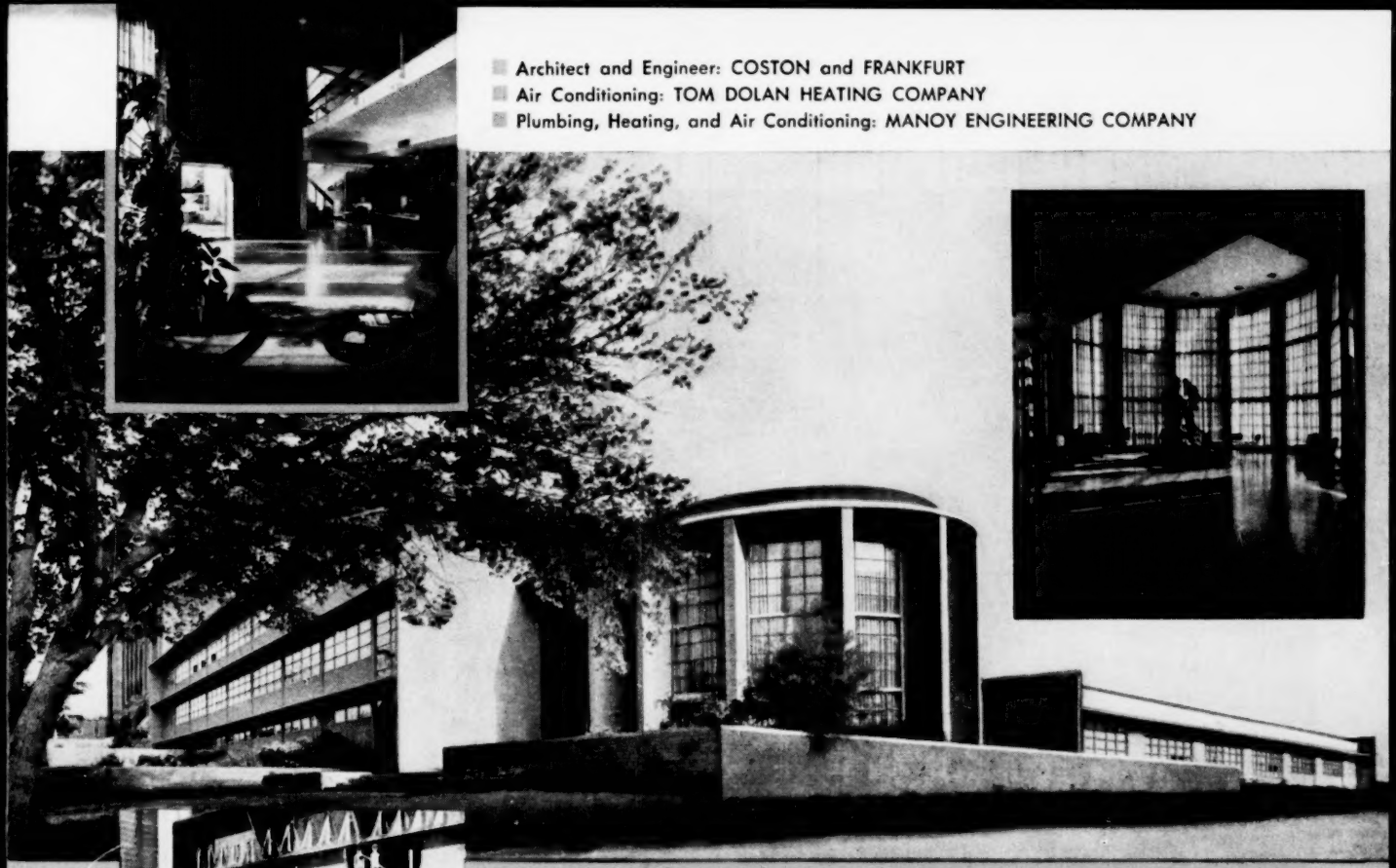
- Plumbing, Heating, and Air Conditioning: MANOY ENGINEERING COMPANY



OKLAHOMA MEDICAL RESEARCH FOUNDATION BUILDING, Oklahoma City

POWERS

Pneumatic System of
AIR CONDITIONING CONTROL

PACKLESS VALVES

Used in this Modern Research Center

Here is another of Oklahoma City's attractive modern buildings completely air conditioned and Powers controlled. It combines a three story research section of 46 laboratory units with a 20 room 16 bed hospital.

Administrative offices, conference and dining rooms, library and cold room areas, one for temperatures down to 34° F. and others down to 0° F. —are all maintained at whatever constant temperature and humidity is required.

Experience gained by Powers here and in many other important small and large buildings will be helpful to you. Why not contact Powers nearest office the next time a temperature and humidity control problem arises? There's no obligation.

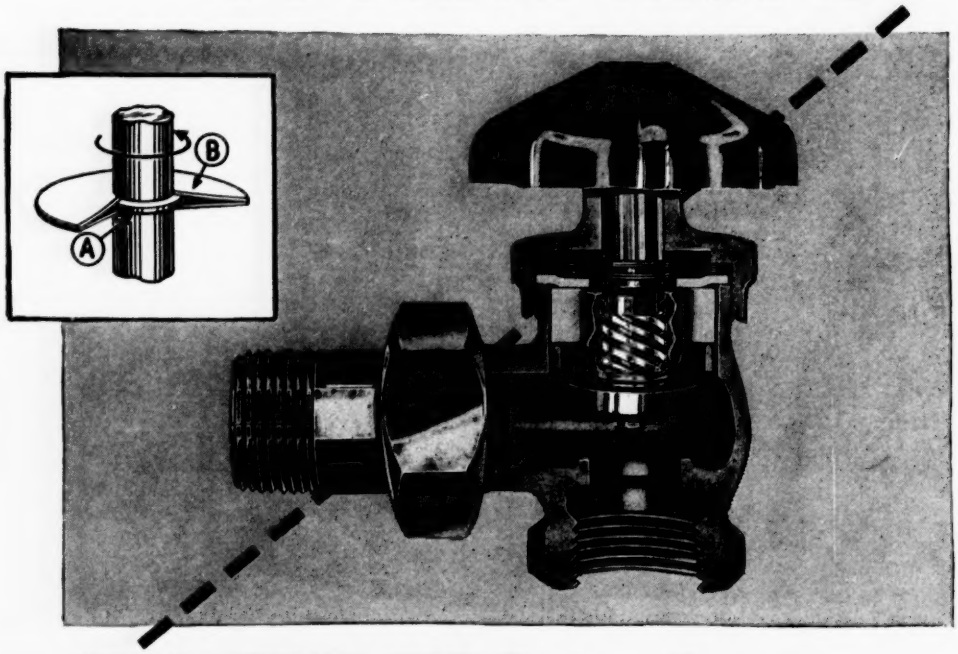
THE POWERS REGULATOR CO.

SKOKIE, ILLINOIS • Offices in Over 50 Cities in the U.S.A.
Canada and Mexico • See Your Phone Book

OVER 60 YEARS OF AUTOMATIC TEMPERATURE CONTROL

(b28)

A Valve that is



PACKLESS in fact

. . . not just packless in name

When the job calls for the kind of valve that will stand up across the years —when it calls for a valve that is packless in the full meaning of the word— then, no matter how far you look, you'll find in the Marsh Packless the only valve that completely fills the bill.

In fact, many users consider this the only valve that is packless in fact as well as in name, and they have a good reason for this. There is a difference between pack less and packless! The diagram tells the story of Marsh truly packless construction. A collar (A) is machined on the valve stem. The stainless spring steel wafers (B) press against this collar to form a tight annular seal This, you see, is a metal-to-metal seal—*permanently* leakproof.

And this better construction is typical of the quality and refinement found throughout the Marsh Packless Valve—in the swivel, self-seating, self-cleaning disc—in the excellent proportioning, machining, workmanship and finish.

Packed valves can and do "blow out", scalding or burning the operator. This danger is avoided when you use the Marsh Packless. It is a valve you can rely on for any service up to 100 lbs. Furnished in a wide range of patterns including graduated and extended stem types, the Marsh Packless Valve is widely used for steam and hot water heating systems, coffee urns, steam kettles, sterilizers, ovens and similar services. Ask our representative or engineering department for facts.

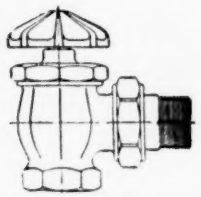
MARSH HEATING EQUIPMENT CO. *Sales affiliate of Jas. P. Marsh Corporation*

Dept. U, Skokie, Ill.

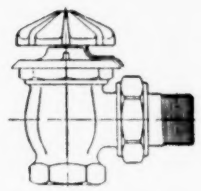
MANUFACTURERS OF GAUGES • THERMOMETERS • WATER REGULATING VALVES • SOLENOID VALVES

MARSH SINCE 1865

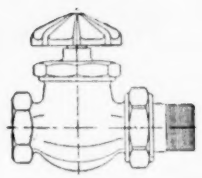
Quality Heating Specialties



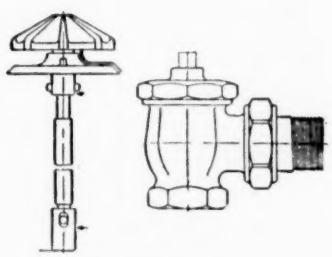
Wheel Angle



Wheel Angle Graduated



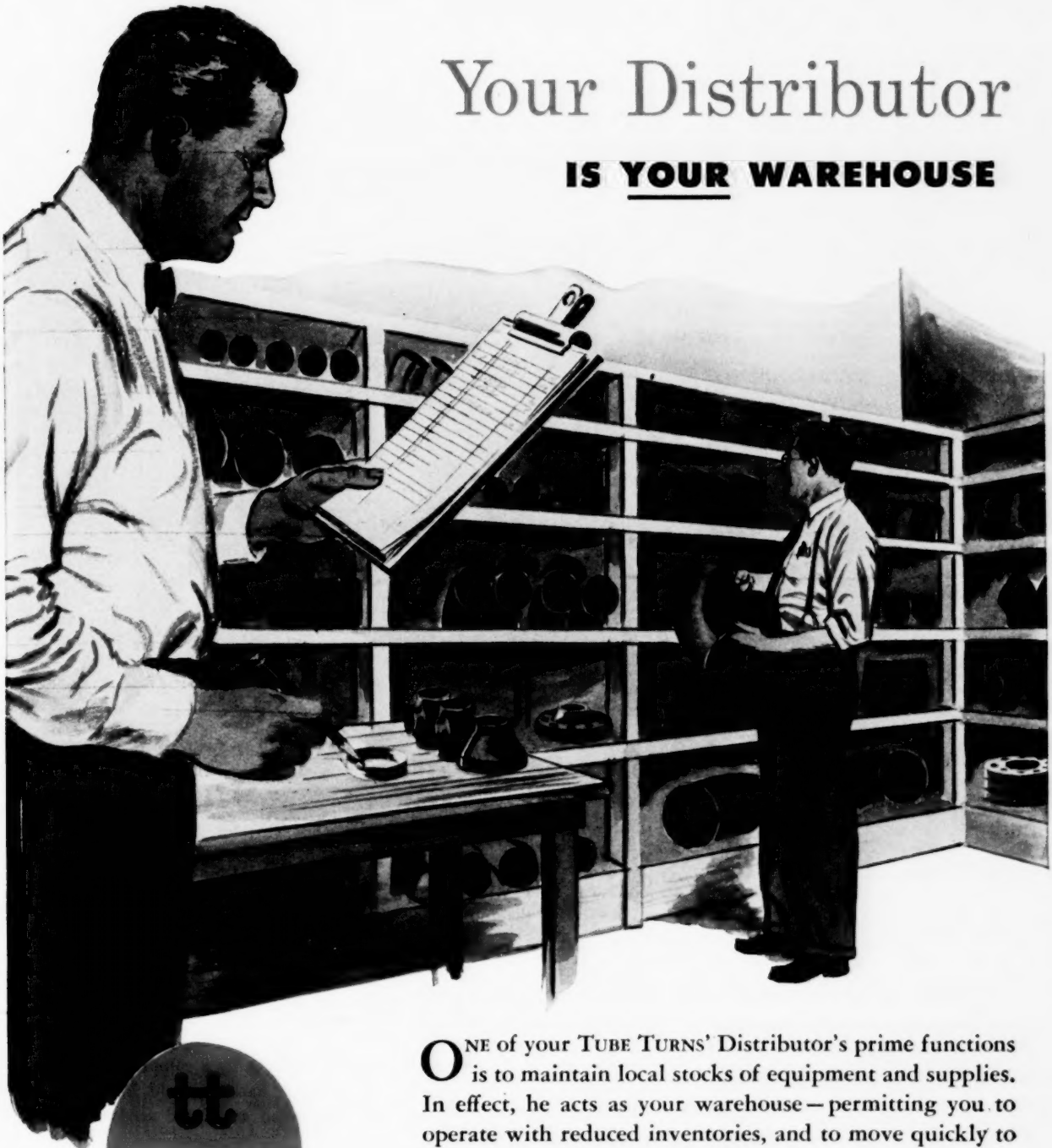
Globe



Extension stem

Your Distributor

IS YOUR WAREHOUSE



ONE of your TUBE TURNS' Distributor's prime functions is to maintain local stocks of equipment and supplies. In effect, he acts as your warehouse—permitting you to operate with reduced inventories, and to move quickly to meet changing production needs.

TUBE TURNS' Distributors and TUBE TURNS, INC., are a service-minded team. Call your nearby TUBE TURNS' Distributors for good service in good connections—it will help you with your inventory and supply operations.

tt TUBE-TURN

"tt" and "TUBE-TURN" Reg. U.S. Pat. Off.

The Leading Manufacturer of Welding Fittings and Flanges

TUBE TURNS, INC. LOUISVILLE 1, KENTUCKY

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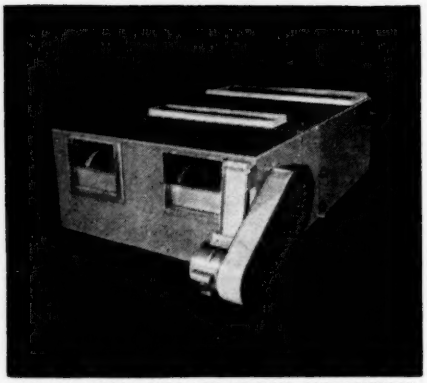
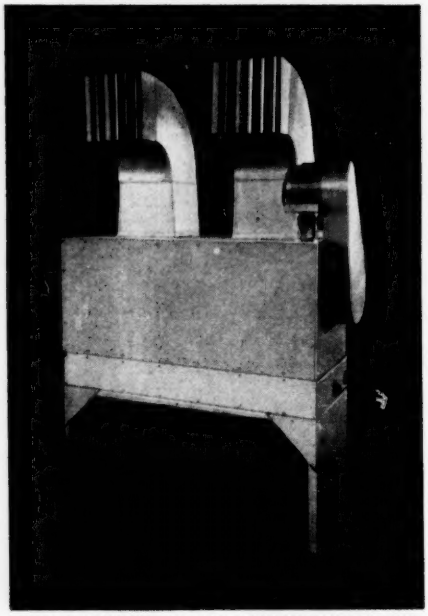
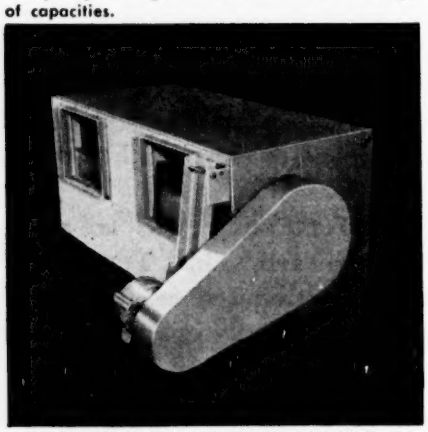
Subsidiaries: TUBE TURNS OF CANADA LIMITED, CHATHAM, ONTARIO • PENNSYLVANIA FORGE CORPORATION, PHILADELPHIA, PA.



HERMAN NELSON TYPE "B" HEATING AND VENTILATING UNIT. This new model features: low outlet velocities—slow fan speeds—a wide selection of heating coils—available with humidifier—and is ideal for institutional and commercial uses.



HERMAN NELSON TYPE "M" CENTRIFUGAL FAN UNIT HEATER. For industrial applications this brand new unit features—high cfm capacities—high heat output—effective air distribution obtained by moderate outlet velocities combined with specially designed nozzles and deflectors. Standard and heavy duty heating coils available in a wide range of capacities.



HERMAN NELSON TYPE "Y" VENTILATING UNIT. This new model features one, two or three fans on a common shaft and housed in compact cabinet for straight-line air movement. Especially useful for booster work in ducts—for untempered air supply or exhaust.

herman nelson announces a

NEW LINE

of air handling equipment

CHECK THE FEATURES OF THE NEW HERMAN NELSON LINE

SECTIONALIZED CONSTRUCTION — all units are constructed for easy installation. Cabinet arrangements can be readily changed on the job site if conditions make this necessary.

SERVICEABILITY — easy access to all components is provided. Heating coils are accessible through the top or bottom of the cabinets and there's a hinged access door for filters.

BUILT FOR LONG LIFE — all models have double width, forwardly curved fans mounted on over-sized shafts with permanently lubricated bearings — mounted outside of air stream.

The new line is quality constructed throughout by a company with a long established reputation in the heating and air handling field. Member of the N.A.F.M. and I.U.H.A. and all units tested and rated according to the respective codes.

for complete information — on these new models — write: HEATING AND VENTILATING DEPARTMENT, AMERICAN AIR FILTER COMPANY, INC., LOUISVILLE 8, KY.

American Air Filter
COMPANY, INC.
294 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

AAF herman nelson

LADISH *Controlled Quality* ASSURES METALLURGICAL SOUNDNESS

TENSILE TEST
One of many comprehensive Ladish laboratory test procedures for assuring reliable performance.

Photographed in Ladish Metallurgical and Research Laboratories

TO MARK PROGRESS

Testing the breaking point of metal... proves Ladish fittings have ample strength to meet the test of maximum service

Optimum strength — proved by scientific test — typifies the outstanding values in Ladish fittings that result from special emphasis on sound metallurgy and advanced facilities. Shown here is modern Universal tensile testing equipment on which ultimate strength, yield strength, reduction of area and elastic properties are carefully measured to assure users of Ladish Controlled Quality fittings the metal quality essential for reliable performance.

THE COMPLETE *Controlled Quality* FITTINGS LINE
PRODUCED UNDER ONE ROOF . . . ONE RESPONSIBILITY

LADISH CO.

CUDAHY, WISCONSIN
MILWAUKEE SUBURB

District Offices: New York • Buffalo • Pittsburgh • Philadelphia • Cleveland • Chicago • St. Paul
St. Louis • Atlanta • Houston • Tulsa • Los Angeles • San Francisco • Havana • Mexico City • Brantford, Ont.

it's NEW!

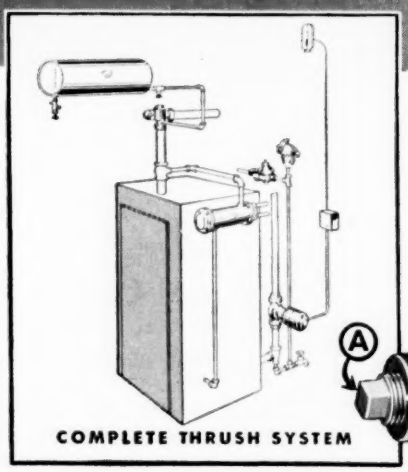
THRUSH Tank Drain

Reduces DRAINING TIME

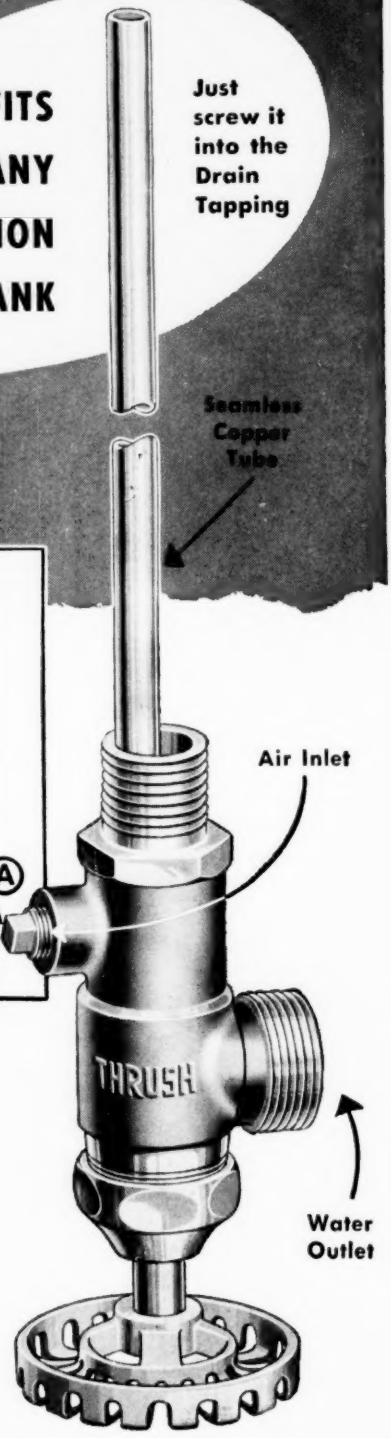
FITS ANY EXPANSION TANK

Just screw it into the Drain Tapping

Seamless Copper Tube



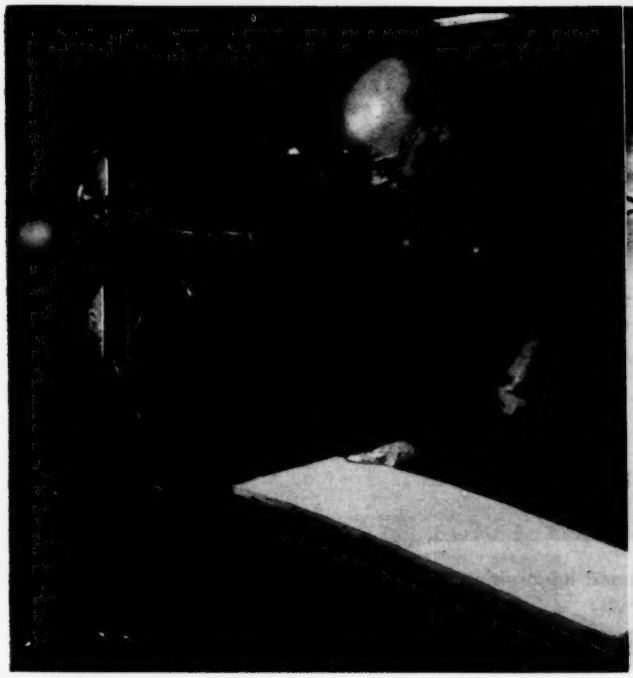
- A simple, inexpensive valve combining air tube and drain.
- Fits drain tapping . . . easily installed . . . inexpensive. Two tube lengths.
- Eliminates guesswork, saves time. A few minutes drains the average size tank.
- Pleases home owner, pays for itself on the first draining.



A REAL CONVENIENCE
and profit maker too!

DRAINING waterlogged pressure tanks is simple, quick and positive if you'll install a Thrush Tank Drain. While all genuine Thrush Pressure Tanks now come equipped with the Thrush Vacuum Breaker, there are many older installations where the tank has only one drain tapping. Now you can enjoy the same convenience in tank draining on these older jobs, too. The Thrush Tank Drain combines Vacuum Breaker and Drain Valve in one inexpensive fitting. When the tank needs draining, simply open drain, remove plug "A" to break the vacuum and tank will drain completely. It is a profit item you can sell all year through. For more information, see your wholesaler or write Department D-11.

H. A. THRUSH & COMPANY · Peru, Indiana



Ultralite Duct Liner, the long glass fiber insulation, has the rugged strength that enables you to acoustically line ducts at the same time you form them! Simply adhere Ultralite to metal before running it through brakes and shears. No danger of ruining the insulation on the truck or on the job, for Ultralite is resilient — won't flake or crumble.

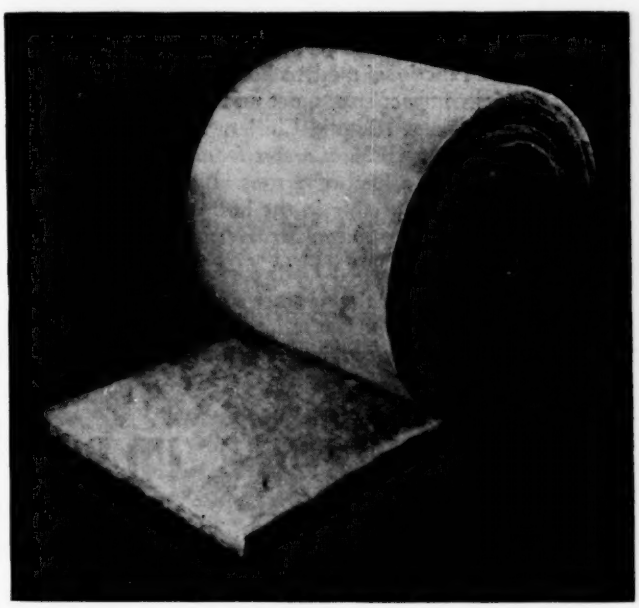
Old hands report duct insulation savings up to 50% when they use the new "wrap-'n-staple" method of insulating ducts with ULTRALITE, the long glass fiber insulation. Simply wrap the duct with vapor-barrier-faced Ultralite. Use a special stapling gun to secure the seams.* (Ultralite has the tensile strength that makes this time-saving step possible.) Apply tapes over seams, paint them with waterproof mastic, and finish as desired.

Insulation "Tricks of the trade" that save you time with

ULTRALITE

Duct Insulation and Duct Liner

ULTRALITE is the only duct insulation and duct liner of long, textile-type glass fibers. This "long-staple" strength makes it far easier and cheaper to store, handle, and apply. Ultralite is feather-light, fire-resistant, non-corrosive, non-irritating and will not flake or fall apart under vibration or air movement. It is available plain, or with 6 different facings, already adhered to the insulation.



*For details and delivery, call your ULTRALITE DISTRIBUTOR, listed in the Yellow Pages in major cities

gb

GUSTIN-BACON MANUFACTURING CO.
222 W. 10th Street **Kansas City, Mo.**

New York • Chicago • Philadelphia • San Francisco • Los Angeles • Houston • Tulsa
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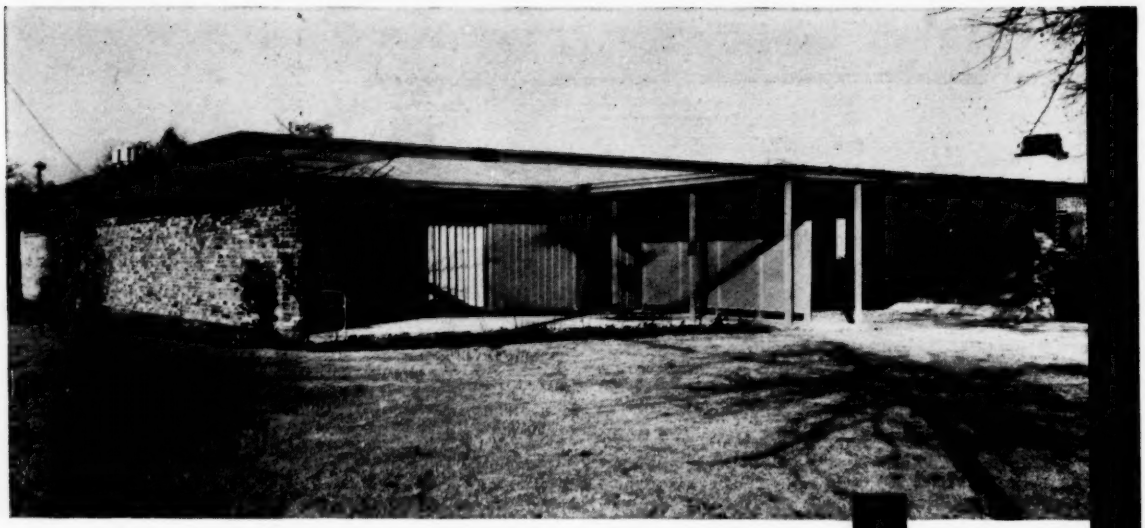
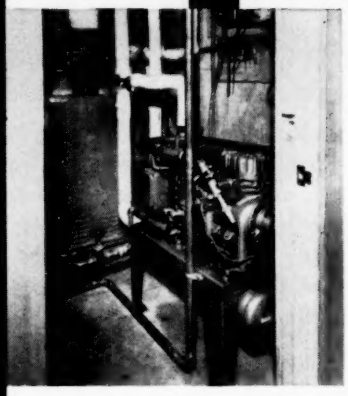


The new home of Herman Blum which received a second honorable mention from the Dallas Chapter of American Architects.

Prize-Winning Home

healthfully air conditioned

by Acme FLOW-COLD®



The Flow-Cold Liquid Chiller fits conveniently in a hall closet to provide a central cooling plant for the whole house.

A central air conditioning plant that fits snugly into a hall closet is just one of the many outstanding design features of this functional modern home located in Dallas, Texas. Selected for its compact size, quiet and efficient operation was the Acme Flow-Cold Packaged Liquid Chiller. Design conditions called for the unit to cool 15 GPM of water from 53 degrees to 45 degrees, thus handling a load of 5 tons. By keeping this 3-bedroom ranch type home comfortable in the hottest Texas weather, the Acme Flow-Cold has proved the wise choice of consulting engineer, Mr. Herman Blum, and the efficient installation of the Beard Plumbing Co.

The Flow-Cold Packaged Chiller was installed in conjunction with a hot water boiler and circulates chilled water in the summer and hot water in winter, with convectors in each room for year-round air conditioning. Versatile, easily installed and pre-tested at the factory, the Acme Flow-Cold can be used effectively by you in your next job — whether you are designing or building homes.

Write us today for more complete information.

ACME INDUSTRIES, INC.

JACKSON, MICHIGAN

Mfgs. of a complete line of Air Conditioning and Refrigeration Equipment

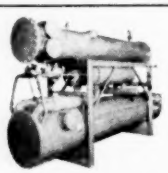
Evaporative Condensers
Cooling Towers
Floor-type Unit Coolers

Direct Expansion (Dry-Ex) and Flooded Liquid Chillers

Heat Exchangers, Oil Separators

Shell and Tube, Shell and Coil Condensers

Receivers, Pipe Coils



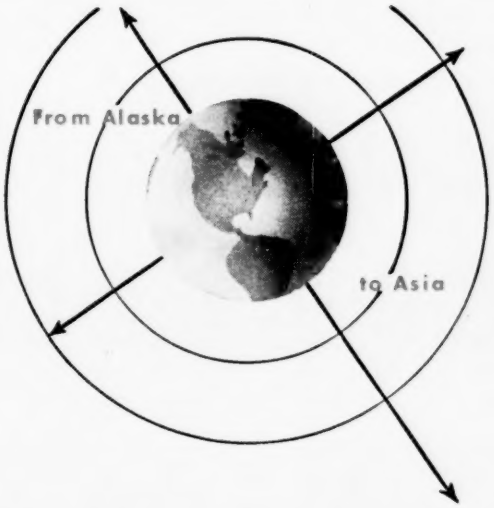
Packaged Liquid Chillers to 225 tons

Flow-Temp Heat Pumps

Flow-Cold Liquid Chillers

Remote Room Conditioner

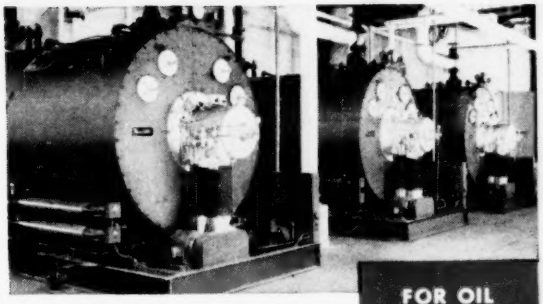
Continuously serving the refrigeration and air conditioning industry since 1919



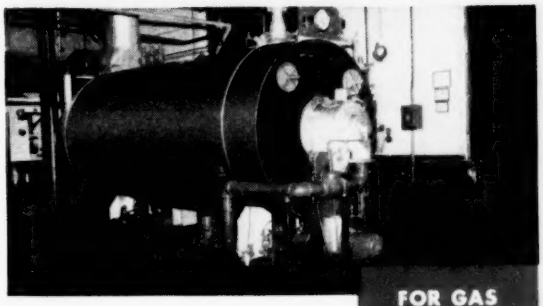
Powermaster®

is a world-wide choice for

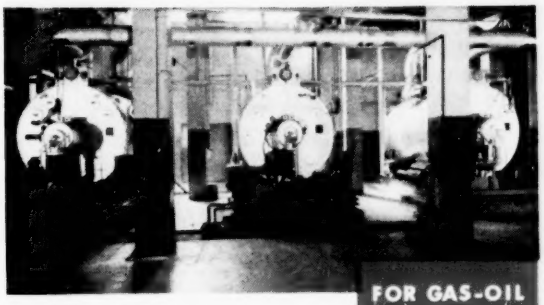
LOW-COST STEAM



FOR OIL FIRING



FOR GAS FIRING



FOR GAS-OIL FIRING

All over America—in U.S. Possessions . . . in Canada . . . South America . . . Europe . . . Asia . . . Africa—thousands of *Powermaster* Packaged Automatic Boilers are now supplying steam and hot water requirements—with outstanding reliability and economy for:

bakeries • beverage plants • canners and food processors • chemical plants • dairies • dry cleaners • hospitals and institutions • hotels • apartment and office buildings • laundries • meat packers • public schools and colleges • tanneries • textile mills • tire and rubber companies • paper mills • railroad shops • manufacturing plants • and many other users.

A large percentage of present users have ordered additional *Powermaster* units . . . and the list of new *Powermaster* users is getting longer every day.

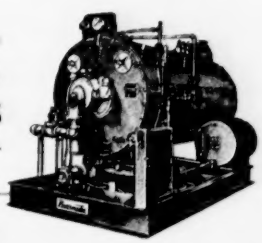
HERE'S WHY — Ease and economy of installation—space-saving compactness—fuel-saving smokeless VORIFLOW combustion—highly efficient operation at all loads—maintenance-saving accessibility—forced draft—full-range automatic modulating firing control—completely automatic operating and safety controls—these are some of the reasons for the steadily growing universal preference for *Powermaster.*

If selecting, installing, or operating boilers is your business, you'll want the complete story of Powermaster cost-saving advantages contained in this new bulletin.

Powermaster®

PACKAGED AUTOMATIC BOILERS

In sizes to 500 HP; pressures to 250 psi.



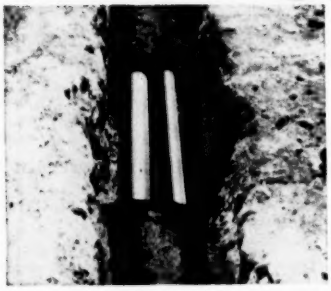
ORR & SEMBOWER, INC. • Established 1885 • **980 Morgantown Road, Reading, Penna.**

FROM A MINE IN UTAH:

THE DISCOVERY that practices and the cost

GILSULATE*...the triple-zone insulation

hot underground pipes. It's water-proof,



GILSULATE forms its own massive circular sheath after backfill and normal introduction of heat (up to 520° F.) through pipes.

GILSULATE—nature's own insulation—is a unique, solidified hydrocarbon. It virtually installs itself: just pour it on...tamp...backfill—the job's insulated. Normal pipe-heat (up to 520° F.) does the rest—fuses the GILSULATE to the pipe in hours, forming a massive circular sheath. Three tough layers completely protect the pipe against heat loss, against water, all types of corrosion, any commonly-encountered buried-line condition. GILSULATE came from the earth and is simply being returned to the earth, where it has laid unchanged for millions of years.

GILSULATE costs less installed per linear foot *than any other hot underground pipe installation*...it's easiest-to-use...and has been tested in scores of the country's largest and most important installations

For a demonstration, write or call your nearest dealer:

California Los Angeles 15, Industrial Insulators, 1244 South Grand Avenue
San Francisco 7, Western Fibrous Glass Products Co., 739 Bryant St.

Canada Montreal, Engineering Equipment Co., Ltd., 874 Beaumont Ave.
Toronto, Michael Stuart Co., Ltd., 116 Bloor St. West

Colorado Denver 2, Joy and Cox, Inc., 2124 Broadway

Georgia Atlanta, American Gilsonite Co., H. L. Armentrout, 831 Briarcliff Road

Illinois Chicago 6, Roy O. Nelson Co., 330 South Wells Street

Indiana Indianapolis 2, Jackson Engineering Co., Inc., 1531 N. Pennsylvania St.

Louisiana New Orleans 6, Edgar Murray Supply Co., Inc., 232 Canal Street

Michigan Detroit 26, John F. Wolff & Co., Penobscot Building, Rm. 702

Minnesota St. Paul 14, Paul W. Abbott Co., 2288 University Avenue

Missouri Kansas City 8, Anderson-Stolz Corp., 1727-33 Walnut Street
St. Louis 1, Eagle Industrial Co., 119 North Seventh Street

New York New York 7, A. F. Hinrichsen, Inc., 50 Church Street
Syracuse 2, H. V. Boggs Co., 419 E. Jefferson Street

Ohio Cleveland 6, William G. Jewett Co., 12417 Cedar Road

Oregon Portland 4, Mead and Associates, 317 S.W. Alder St., Rm. 1100

Pennsylvania McKees Rocks, Tutein and Bickell, 429 Broadway

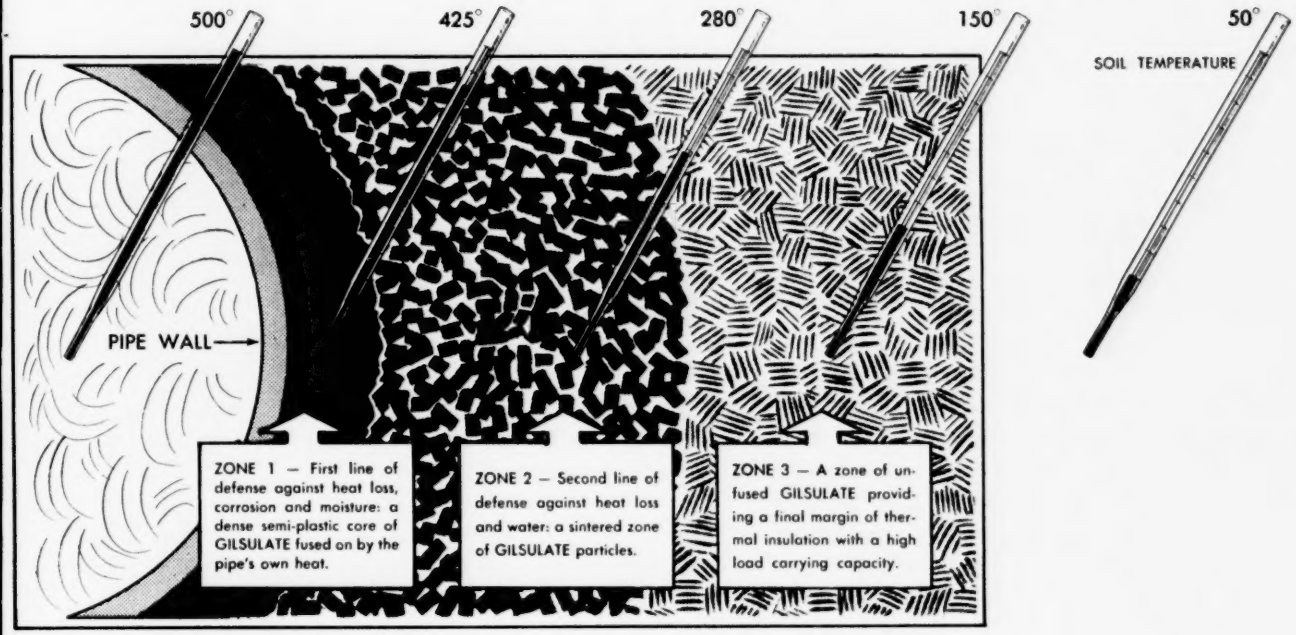
Texas Houston 11, Mundet Cork Corp., 6601 Supply Row

Utah Salt Lake City 1, Williams, Gritton & Wilde, 204 Cooly Building

Washington Seattle 66, Winsor Co., 20031 Marine View Drive, S.W.

* *GILSULATE is a blend of specially sized and selected Gilsonite, a unique solidified hydrocarbon of high resin content found only in eastern Utah. Gilsonite has been in use since 1887 in paints, inks, asphalt tile, storage battery boxes, etc. Its remarkable insulating properties are a recent discovery.*

can revolutionize the insulation of buried pipe installations..


500°
425°
280°
150°
50°
SOIL TEMPERATURE
PIPE WALL
ZONE 1 — First line of defense against heat loss, corrosion and moisture: a dense semi-plastic core of GILSULATE fused on by the pipe's own heat.
ZONE 2 — Second line of defense against heat loss and water: a sintered zone of GILSULATE particles.
ZONE 3 — A zone of unfused GILSULATE providing a final margin of thermal insulation with a high load carrying capacity.

that fuses itself into lifetime protection for corrosion-proof, root-proof, acid/alkali-proof

A few additional GILSULATE advantages:

- *3 grades available* covering 220°-520° F.
- *needs no sleeves* or mechanical sheaths to protect insulation
- *requires no mixing* or special handling
- *can't be punctured*—leave rocks in backfill
- *needs only normal pipe spacing*—steam and condensate lines can run side by side
- *pipe contracts and expands* within GILSULATE structure
- *repairs to pipe* are quick and easy
- *proved in actual use* in hundreds of new construction and replacement installations
- *widely preferred*—by heating, ventilating and mechanical engineers, architects, contractors in central steam installations, chemical and petroleum plants, construction projects, industrial power plants, utilities, and state institutions.

For descriptive literature, fill in the coupon below.

AMERICAN GILSONITE COMPANY
SALT LAKE CITY, UTAH
Affiliate of Barber Oil Corp. and Standard Oil Co. of California

GILSULATE can be used for replacement of old-fashioned, worn-out, or corroded insulation.

GILSULATE®

THE TRIPLE-ZONE INSULATION
FOR LIFETIME PROTECTION
OF HOT UNDERGROUND PIPES

American Gilsonite Co.
248 South Main St.
Salt Lake City 1, Utah,
or 1145 East Jersey Street, Elizabeth 4, N. J.

Please send me descriptive literature on GILSULATE.

NAME .....

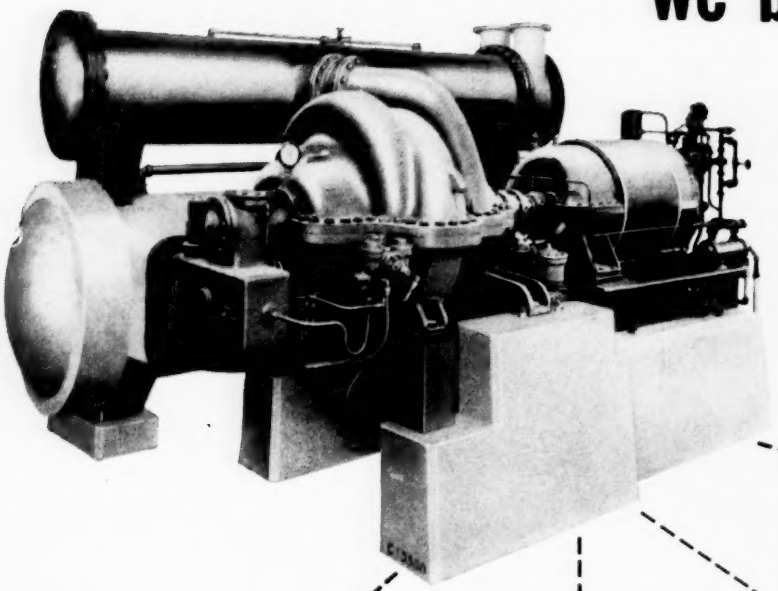
TITLE .....

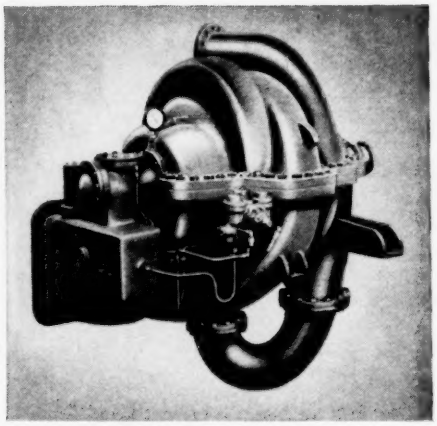
COMPANY .....

ADDRESS .....

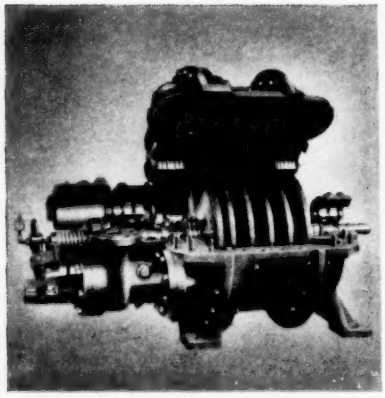
HP

We know it'll do a job for you . . . we built all of it!

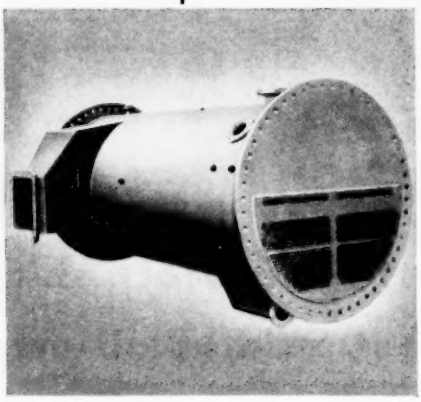




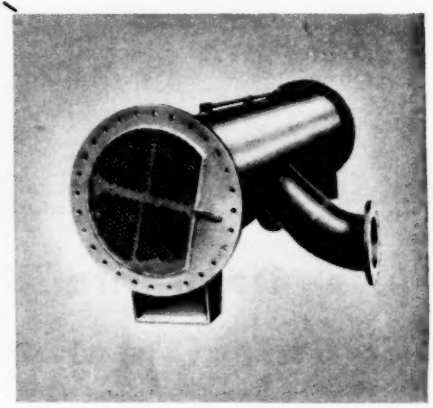
INCREASED EFFICIENCY results from volute design of the Worthington centrifugal compressor. Smooth, obstruction-free passage for gas reduces friction and turbulence losses.



TYPICAL WORTHINGTON MULTI-STAGE steam turbine, ideally suited for compressor-drive applications.



OVERALL SAVING in power consumption is made possible by the flash pre-cooling chamber in the Worthington cooler.



WORTHINGTON CONDENSERS are of the horizontal shell-and-tube type, with water inside the tubes and refrigerant gas outside.

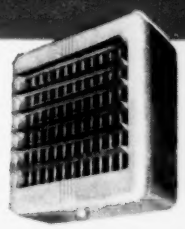
Every major component in a Worthington centrifugal refrigeration system is designed, engineered and built at the Worthington plant. Worthington, for example, is the only manufacturer that builds drives as well as compressors.

This is one big reason why leaders in industry are turning more and more to Worthington centrifugal refrigeration systems. Present-day installations include CBS Television City; the new Alcoa Building, Pittsburgh; Saks Fifth Avenue; the Hotel Commodore, and the General Petroleum Building in Los Angeles.

Worthington also makes condensers, coolers and auxiliary equipment such as steam condensers, condensate pumps, steam jet air ejectors and step-up gear sets. Write for free Centrifugal Refrigeration Bulletin C-1100-B14 to Worthington Corporation, Air Conditioning and Refrigeration Division, Harrison, New Jersey. A.3.41

WORTHINGTON

CLIMATE ENGINEERS TO INDUSTRY, BUSINESS AND THE HOME



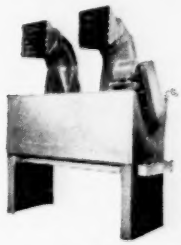
HORIZONTAL UNIT HEATERS

These unit heaters are offered for normal applications where horizontal air flow is desired. In 24 sizes with capacities ranging from 21,600 to 360,000 Btu per hour.

McQuay Down Flow Unit Heaters

Heating dollars go further when McQuay Down Flow Unit Heaters are installed. They are especially recommended for saving heat ordinarily wasted in buildings with high ceilings. These vertical unit heaters have the famous Ripple Fin Coils. Providing peak heating efficiency, they lower heating costs by circulating evenly and gently this normally stratified air.

In the McQuay line are 22 down flow units to meet your exact requirements. Capacities range from 25,400 to 500,000 Btu per hour. Four styles of directional air diffusers are available to provide any desired air distribution. Consult the McQuay representative in your city or write McQuay Inc., 1619 Broadway N.E., Minneapolis 13, Minn.



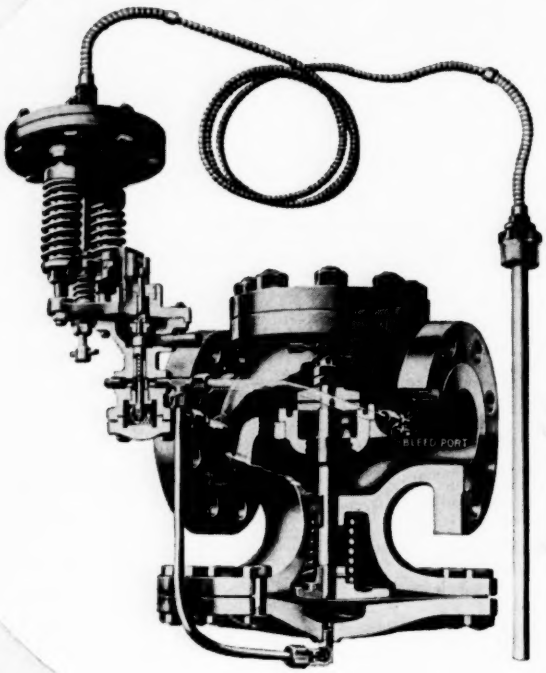
BLOWER TYPE UNIT HEATERS

For effective heat distribution over large open areas. Available in 8 sizes . . . in suspended and floor models, with one and two row coils; capacities from 20,620 to 1,632,000 Btu per hour.

McQuay INC.

HEATING • AIR CONDITIONING REFRIGERATION

3 Reasons for Accurate Regulation



PACKLESS CONSTRUCTION

LARGE BALANCED METAL DIAPHRAGM

SENSITIVE PILOT

Spence

Packless construction eliminates the need for closely fitted parts that may stick or bind due to dirt or uneven expansion of the parts.

In Spence Temperature Regulators, the Main Valve is actuated by a large balanced metal diaphragm which responds to the slightest changes in temperature.

Sensitive Pilots are designed to limit heater pressure to an adjustable maximum. As the temperature at the thermostat drops a few degrees there is a corresponding increase in steam pressure up to the limit for which the Pilot is set.

With regulators that respond only to temperature, an increase in load is accompanied by a momentary decrease in steam pressure caused by faster condensation in the heating element. There is a time lag until the thermostat senses the temperature drop and opens the valve wider. Spence Temperature Regulators act like pilot operated pressure regulators when this occurs. They respond instantly to maintain the steam pressure until the thermostat has a chance to further increase it as needed for the heavier load.

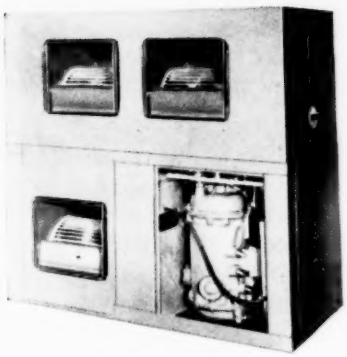
These plus other design features explain why Spence Temperature Regulators function dependably and accurately year after year, without requiring extensive repairs or special attention.

Want more facts? Write for Bulletin T50 giving full details.

SE128

SPENCE ENGINEERING COMPANY, INC., Walden, New York

"Packaged" Air Conditioners Six water-cooled models, from 2 to 15 h.p.



New "Packaged" Air-Cooled Air Conditioners *use no water*—require no plumbing. 2 and 3 h.p.

FEATURES THAT MAKE CHRYSLER AIRTEMP COST LESS TO INSTALL...

can make more money for you!

A Chrysler Airtemp "Packaged" Air Conditioner is unusually quiet in operation because the radial design of its compressor permits perfect balancing of cylinders. So, you can install the air conditioning unit right in the area to be cooled—or very close to it. This reduces the amount of ductwork required.

For other important reasons, too, you can often install Chrysler Airtemp at lower cost. Units are shipped to you *completely* factory-assembled, pre-charged with Freon. On the job, you can take conditioned air from the top of a unit, dispensing with the plenum, or direct it into the area from front or back simply by turning the plenum around. You can even "split" a unit easily, placing the compressor assembly on floor and balance of unit above shelving or other fixed objects.

Lower installation cost with Chrysler Airtemp gives you a competitive advantage which you can turn into more sales—more profit. And the installation time you save can permit you to handle more business—without adding manpower. Send coupon now for all the reasons why it will *pay you more* to sell the "Packaged" Air Conditioning which most people buy—Chrysler Airtemp.

Guaranteed by Good Housekeeping

Be sure to visit the
CHRYSLER AIRTEMP EXHIBIT
at the
8th ALL-INDUSTRY REFRIGERATION and AIR CONDITIONING EXPOSITION
Cleveland, Nov. 9 Thru Nov. 12
SPACE 412

Chrysler Airtemp

HEATING • AIR CONDITIONING
for HOMES, BUSINESS, INDUSTRY
Airtemp Division of Chrysler Corporation
Dayton 1, Ohio

Airtemp Division of Chrysler Corporation H&V-11-53
P.O. Box 1037, Dayton 1, Ohio

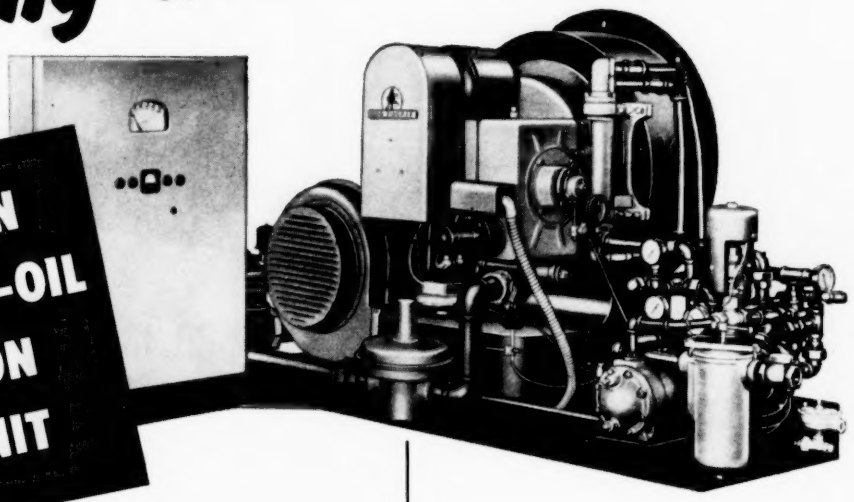
I would like to know more about the Chrysler Airtemp proposition.

Name _____

Address _____

City _____ Zone _____ State _____

"Packaged" for better firing at lower cost



IRON FIREMAN OIL, GAS or GAS-OIL COMBINATION BURNER UNIT

factory assembled and tested

This Iron Fireman firing unit is much more than just a burner. It's a complete combustion system, including burner, automatic controls, fuel system and forced draft air supply integrated into a single balanced package unit. It is readily applied to Scotch marine or other types of high or low pressure boilers by bolting to the boiler front.

To the user this means an attractive saving in installation time and cost. But even more important, it means a factory assembled and tested unit instead of a locally assembled job. It means dependable performance and high operating efficiency, with substantial fuel savings. It's the *smart* way to modernize your boiler room.

See your Iron Fireman dealer or write for further information to Iron Fireman Manufacturing Company, 3075 West 106th Street, Cleveland 11, Ohio. In Canada, write 80 Ward St., Toronto, Ontario.

1. Assembled and tested at factory instead of on the job.
2. Applicable to practically all types of boilers.
3. Continuous high combustion efficiency.
4. No high stack—requires only vent pipe.
5. For either gas or oil firing. Combination burners quickly shifted from one fuel to the other.
6. Burns low-cost heavy oils (No. 6 or any lighter grade).

THE IRON FIREMAN

Iron Fireman®

Gas, Oil, Coal firing equipment for heating, processing, power

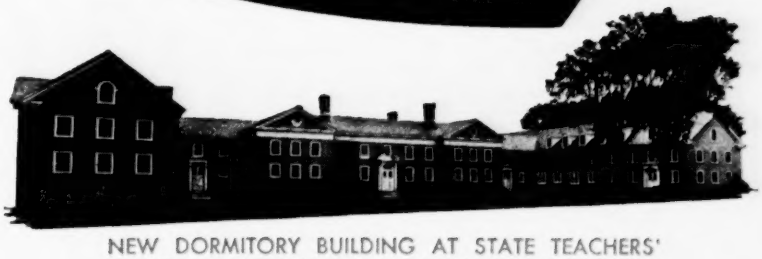
ANOTHER REPORT OF READING COPPER TUBE "ON THE JOB" . . . .

F. C. SPETH, Plattsburg, N. Y.
Plumbing and Heating Contractor Says:

"BIG JOB or LITTLE JOB . . . I install READING COPPER TUBE Every Time"

F. C. Speth, plumbing and heating contractor on many outstanding installations through upper New York state and Vermont, has found from experience that whether a job is large or small, he can count on Reading for fast, dependable service. Other reasons cited by Mr. Speth for his preference for Reading Copper Tube are its ease of handling and bending . . . fewer number of joints required . . . uniform high quality resulting from precision manufacture to close tolerance standards . . . and long, trouble-free service.

Reading Tube Corporation is proud of this case history of one more contractor's experience and satisfaction with Reading Copper Tube which is typical of thousands of contractors throughout the United States.



NEW DORMITORY BUILDING AT STATE TEACHERS' COLLEGE, PLATTSBURG, N. Y. in which 15,000 feet of Reading Copper Tube were installed.

ARCHITECTS: Benedict, Ryan & Sayer, Plattsburg, N. Y.
ASSOCIATE ARCHITECTS: Reisner & Urbahn, New York, N. Y.
GENERAL CONTRACTOR: J. J. Harvey, Utica, N. Y.
PLUMBING CONTRACTOR: F. C. Speth, Plattsburg, N. Y.

READING TUBE CORPORATION

Producers of Reading Lektroneal Copper Tubing and Reading 85% Grade A Red Brass Pipe

READING COPPER · BRASS TUBE

Sold Exclusively Through Plumbing and Heating Supply Wholesalers!

OFFICES AND EASTERN DISTRIBUTION DEPOT:
36-12 47th Ave., Long Island City, N. Y. • STillwell 6-9200
WORKS: READING, PA.

DISTRIBUTION DEPOTS: • Reading, Pa. • Long Island City, N. Y. • Chicago, Ill., 724 W. 50th St. • Houston, Texas, 1121 Rothwell St. • Atlanta, Ga., 690 Murphy Ave., S.W. Unit 5, Bldg. B

CHASE® copper water tube *goes in for good!*

See that shiny Chase Copper Water Tube! Smart plumbers choose it every time. They know it's lightweight, easy to handle, and *it makes satisfied customers for years to come.*

Chase Copper Water Tube is corrosion-resistant . . . *won't clog with rust* and always gives a full flow of rust-free water.

Chase Copper Water Tube and Chase Solder-Joint Fittings are a combination that just can't be beat for hot and cold water lines, radiant panel heating and for drainage lines, too. Sold by Chase plumbing and heating wholesalers.

Chase® BRASS & COPPER

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

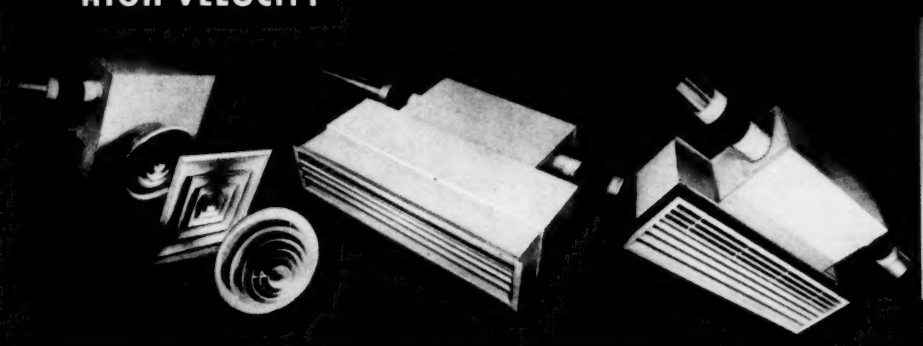
The Nation's Headquarters for Brass & Copper

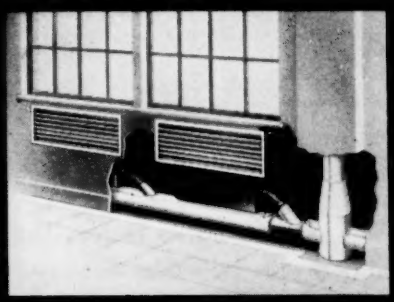
Albany†	Cleveland	Kansas City, Mo.	New York	San Francisco
Atlanta	Dallas	Los Angeles	Philadelphia	Seattle
Baltimore	Denver†	Milwaukee	Pittsburgh	Waterbury
Boston	Detroit	Minneapolis	Providence	
Chicago	Houston	Newark	Rochester†	(†sales
Cincinnati	Indianapolis	New Orleans	St. Louis	office only)

No matter ***which***

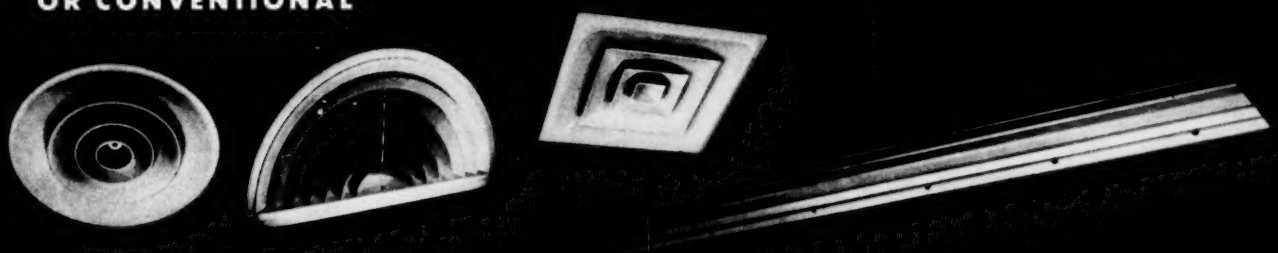
air conditioning system you use...

HIGH VELOCITY





OR CONVENTIONAL



when these are in sight the installation is right

ANEMOSTAT®

DRAFTLESS *Aspirating* **AIR DIFFUSERS**

ANEMOSTAT CORPORATION OF AMERICA

10 EAST 39th STREET, NEW YORK 16, N. Y.

REPRESENTATIVES IN PRINCIPAL CITIES

"No Air Conditioning System Is Better Than Its Air Distribution"

Now Ready.!

The New Skidmore Duplex Unit offers increased heating pump efficiency. Compact and self-contained — the "CV" Duplex Unit has all the outstanding features of the Skidmore "CV" Single Unit plus extra heavy-duty performance when conditions warrant.

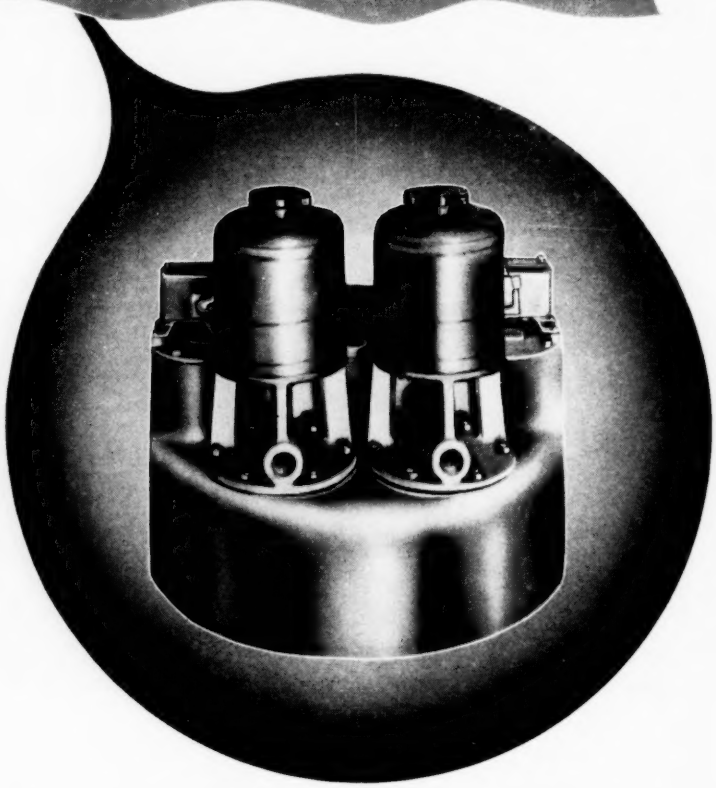
LEFT—SINGLE UNIT

BELOW—DUPLEX UNIT

The NEW "CV" Duplex Unit!

The New Skidmore Duplex Unit is furnished with individual float switches, so each pump may be controlled independently or with automatic alternating switch, which affords a positive means of alternating the operation of the two pumps in turn insuring even wear. The second pump automatically starting into operation when one pump cannot handle the load under peak conditions. Pump is completely assembled ready for return and discharge connections —can be installed on the floor level or in pit — float switch is on top for convenient operation.

NOW READY—New Bulletin No. 21-A gives complete engineering data on both the Vertical "CV" Single and Duplex Units.

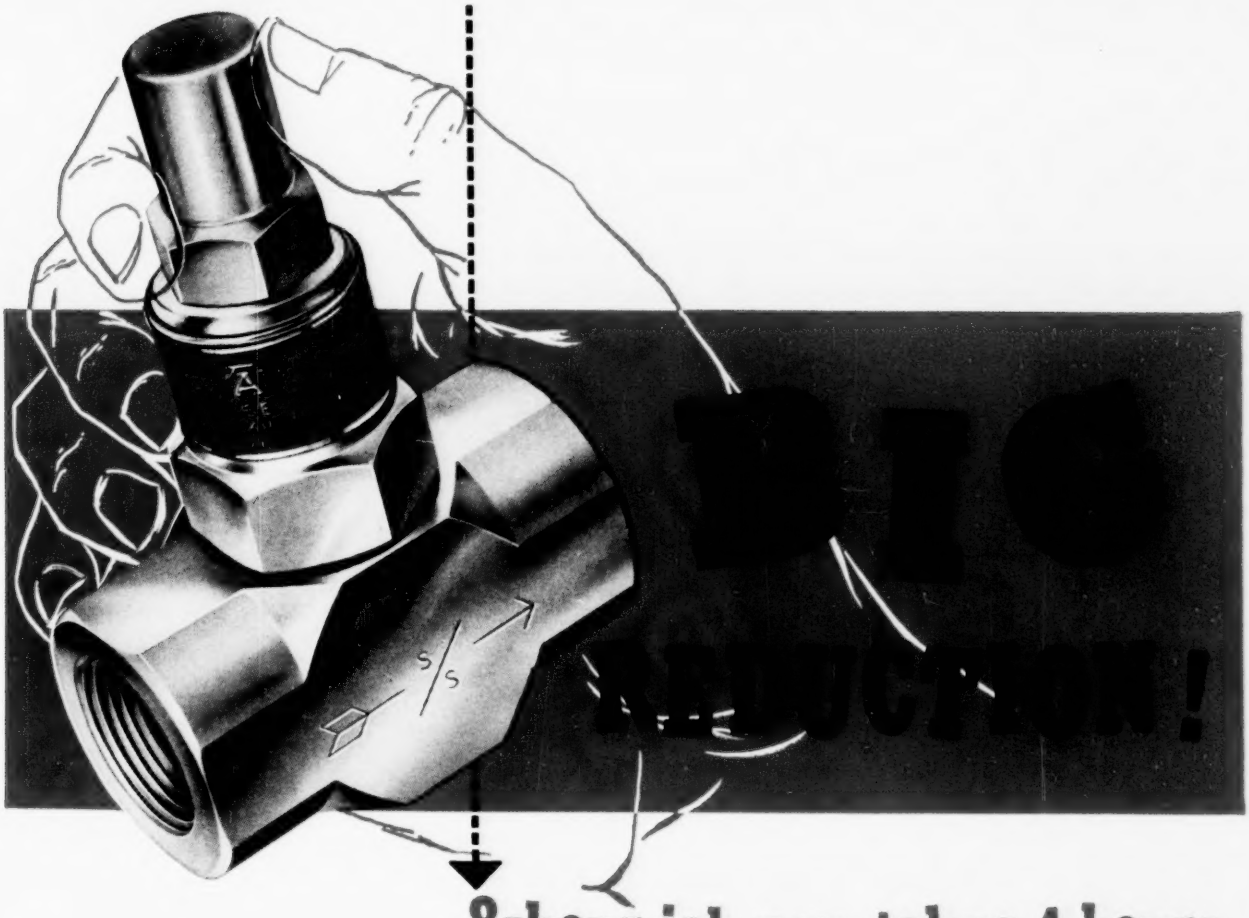


The Duplex Unit above, has two separate float switches to control each pump independently.

Skidmore builds a type for every installation.

Write for bulletins on other heating pumps.

SKIDMORE CORPORATION ● ST. JOSEPH, MICHIGAN



8-hour job now takes 4 hours

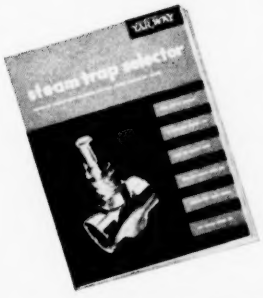
At a western magnesium reduction plant something besides magnesium has just been reduced. The steam at the end of the 1½ mile long steam line wasn't so hot—and neither was the production record of the plant at that location.

Then 26 old-type steam traps were replaced with Yarway Impulse Traps. Now there is only a 15° temperature drop from the boilers to the end of the line. *Most important, the plant 1½ miles from the boilers is now able to do work in 4 hours that previously took 8 hours.*

That's trap efficiency! It's evidence of the fact that Yarways are designed to send the most premium B.T.U.'s at top temperatures into your process or product. *They get equipment hotter, sooner . . . and keep it hot.*

Other Yarway features—small size, one moving part, easy installation, low maintenance, low cost, stainless steel construction. Nearly 750,000 Yarways have already been installed. For your Yarways, see a nearby industrial distributor . . . 216 stock and sell Yarways.

YARNALL-WARING COMPANY, 104 Mermaid Ave., Philadelphia 18, Pa.



FREE TRAP SELECTOR

It's important to have the right trap in the right place. New 20-page selector tells quickly and easily which *is* the right Yarway trap for any application. Write for your free copy.

YARWAY

the steam trap

designed with more production in mind

A Prospect for Snow Melting lives here!

The owner of this attractive home is undoubtedly a successful business or professional man. As such he is necessarily intelligent.

He *knows* (1) that men unaccustomed to the routine of strenuous work should not risk the exertion of snow shoveling, (2) that temporary help is usually impossible to get when most needed, (3) that in cases of emergency the ability to get *out* of house or garage is quite as important as getting in, (4) that totaled over the years the cost of snow removal by hand labor reaches an unbelievably high amount.

So, he is a *good* prospect for steel pipe snow melting!

Yes, many home owners in the snowbelts have reasoned it through and have installed driveway and sidewalk snow melting systems not only as a wonderful convenience and safety measure but also as an economically justifiable investment in added property value.

Steel pipe helps to make it so. For steel pipe is economical, durable, weldable and formable for grids and coils, and has a proved background of performance in more than 60 years of conventional steam and hot water heating applications. In fact, for snow melting, radiant heating and other wet heat installations, steel is the most widely used pipe in the world!

A free 32 page color booklet, "Steel Pipe Snow Melting and Ice Removal Systems," has been prepared, answering the most commonly asked questions about snow melting. It includes technical data on design, piping layouts, temperature requirements, boiler capacities and other information for domestic, commercial and industrial uses. Ask for it.

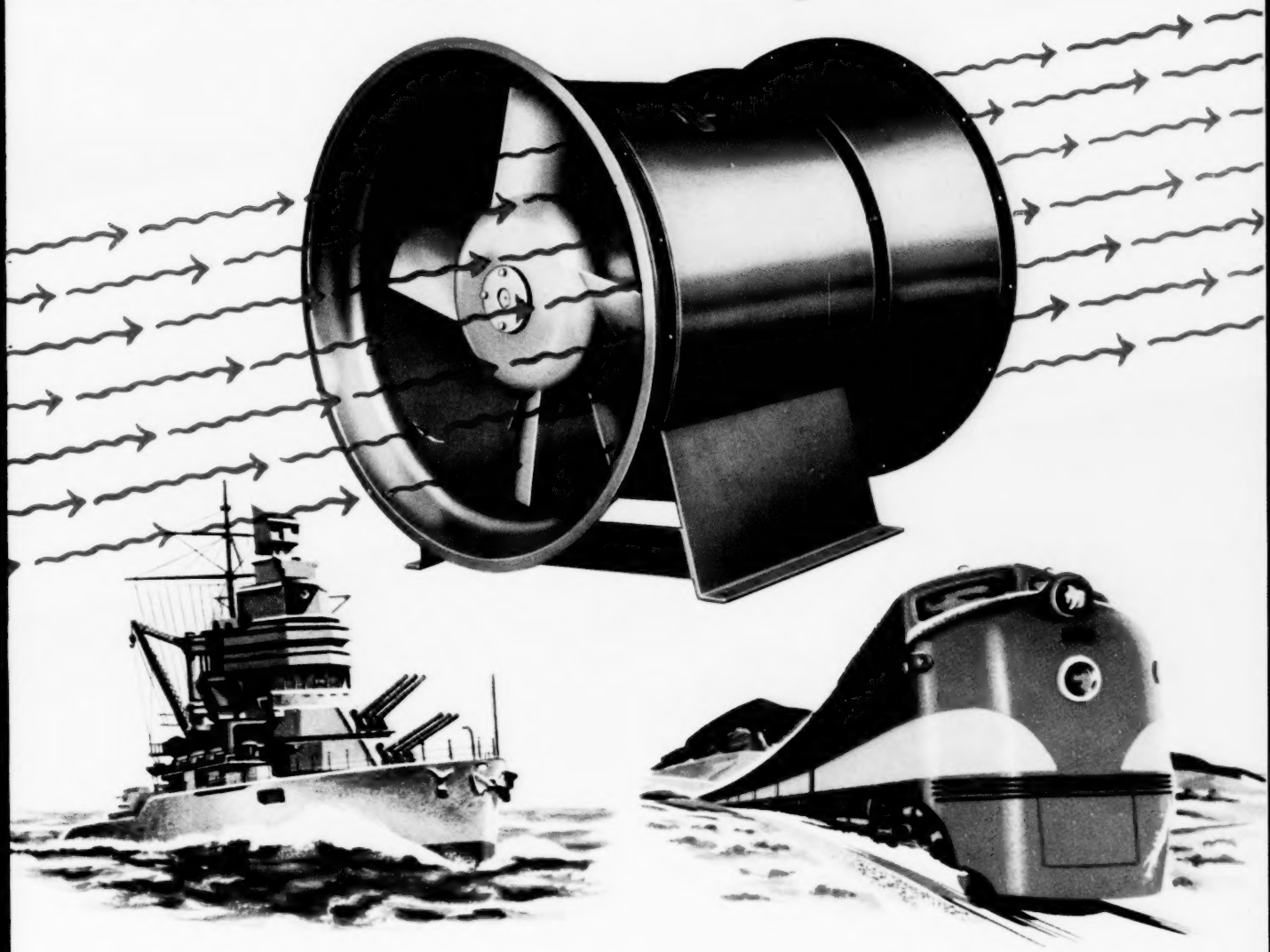
Steel Pipe is First Choice

COMMITTEE ON STEEL PIPE RESEARCH

AMERICAN IRON AND STEEL INSTITUTE

350 Fifth Avenue, New York 1, N.Y.

American Blower – a time-honored name in air handling



Dependable, low cost ventilation!

The Navy demands it on battlewagons . . .

Railroads specify it for modern streamlined trains . . .

Commerce and industry require it for the conduct of profitable business . . .

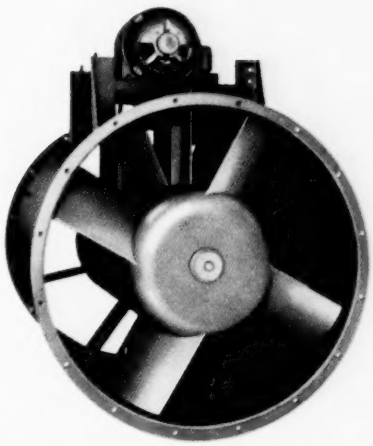
No one company has done more to provide dependable low cost ventilation than American Blower.

For example, American Blower Axial Fans are widely used in thousands upon thousands of varied applications, and are unsurpassed for ease of installation and efficient performance.

For complete information on axial fans and other American Blower Air Handling equipment, contact our nearest branch office.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary Corporation



American Blower Axial Fans are smooth in performance, built for endurance and convenient to install.

AMERICAN BLOWER

YOUR BEST BUY IN AIR HANDLING EQUIPMENT

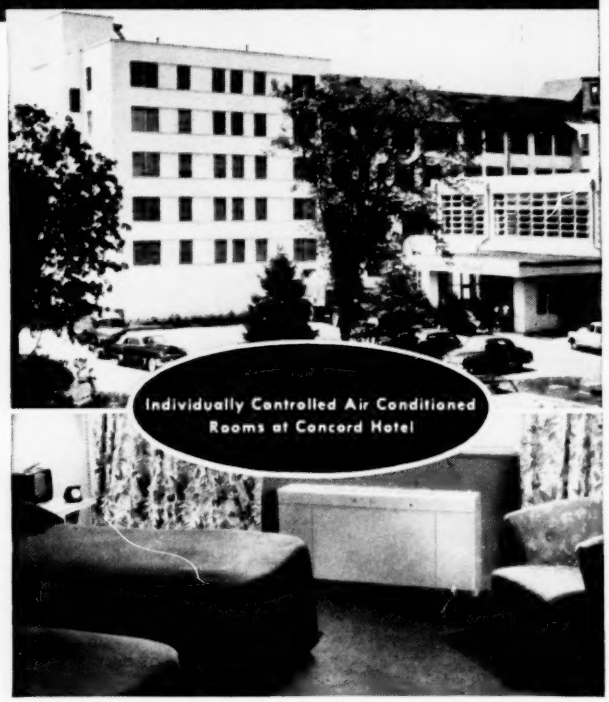
Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS

Another interesting REMOTAIRE installation!

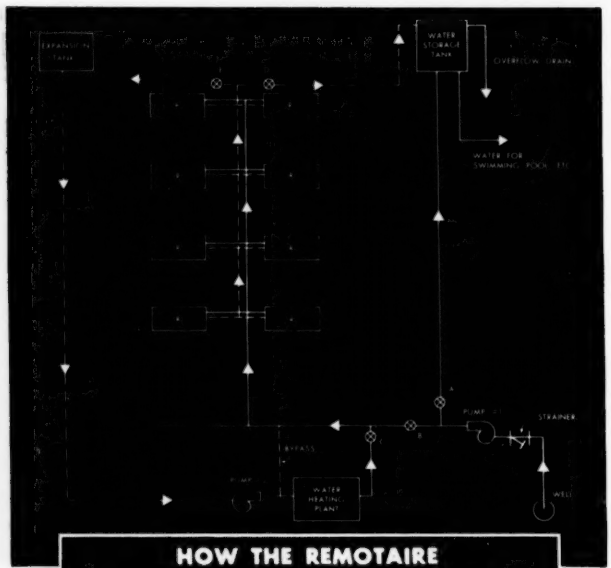
Individual-room remote type units in resort hotel provide year 'round air conditioning

Summer cooling... winter heating



● The Concord Hotel, Kiamesha Lake, New York, found the answer to efficient, economical year 'round air conditioning through the installation of the Remotaire Well Water System—one of a number of different Remotaire systems available for multi-room buildings.

The Remotaire Well Water System may be used in localities where well water is known to be available in adequate supply, proper temperature, and of good quality. The cold well water is used in lieu of a water chilling plant. Consisting of Remotaire Room Units in each room connected by a piping system to the central plant equipment (as shown in the diagram), this system costs less to install and less to operate. Individual control of each Remotaire unit allows the occupant to choose the room temperature that suits him best without affecting adjoining rooms.



HOW THE REMOTAIRE WELL WATER SYSTEM WORKS

The Remotaire Well Water System consists of Remotaire Room Units in each room connected by a simple piping system to the central plant equipment—a well with pump, water heater, water circulating pump, expansion tank, storage tank and water filter or strainer as shown above.

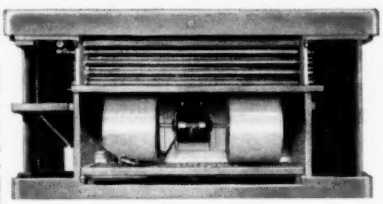
FOR COOLING—Valves A and C are closed. B is open. Pump No. 1 pumps water from well to Remotaire units on each floor from which it travels thru valve D to storage tank on roof. This water is usable for swimming pool or other purposes.

FOR HEATING—Heating circuit includes Water Heater, Valve C, Valve E, Expansion Tank, Pump No. 2 and bypass. For operation, close Valves B and D, start Pump No. 2 and boiler, and the hot water circulates through the system.

When cooling is not required, well water may be used for other purposes, and can be pumped direct through Valve A to Water Storage Tank by Pump No. 1.

This resort hotel installation is another example of the versatility of the Remotaire for hotels, motels, hospitals, apartments, and other multi-room buildings.

Top Quality Construction... Easy To Install



The Remotaire is sturdily built of heavy-gauge steel—plus a reinforced air grille—with a bonderized, baked-on semi-gloss enamel finish. All air passages are acoustically insulated for thermal efficiency and quietness. Coil is designed for right or left hand connections. Spacious end compartments permit easy access to coil connections and controls. Adaptable to a variety of ventilation systems, the Remotaire is ideal for modernization as well as new construction and is available in three models—200, 400 and 600 cfm.

Write for Remotaire Brochure, Form 298.

American Radiator & Standard Sanitary Corporation
P. O. Box 1226, Pittsburgh 30, Pa.

AMERICAN-Standard
HEATING-COOLING

Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE
DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS

you get

UNIFORMITY

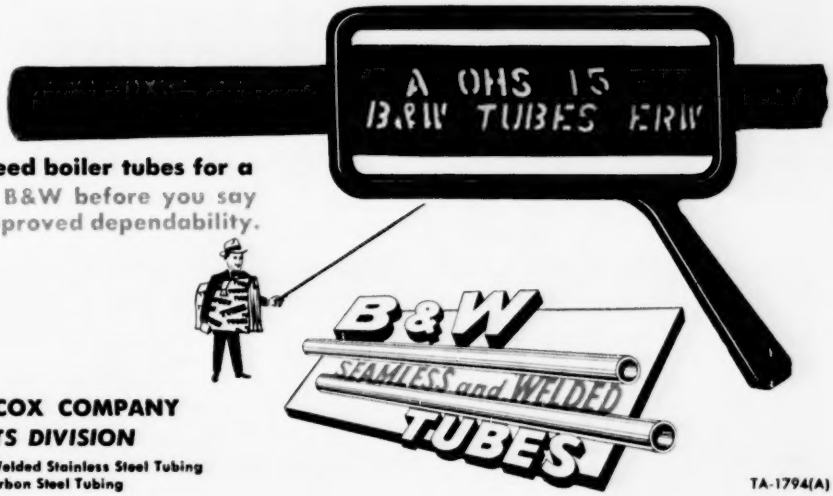
when you get

B&W Welded Boiler Tubes

Uniform wall thickness, diameter, and concentricity . . . uniform physical properties and characteristics . . . *consistent uniformity from tube to tube* for easier fabrication and rolling-in, greater strength, and longer life between retubings.

You'll find B&W Welded Boiler Tubes giving long and faithful service in boilers of all types and pressures—from the lowest to the highest—and serving the widest variety of applications. You'll recognize B&W tubes by their "brand".

LOOK FOR THIS
—wherever fine boilers are operating efficiently over extended periods.



Ask for them the next time you need boiler tubes for a new boiler or retubing job. Say B&W before you say WELDED BOILER TUBES—for service-proved dependability.

THE BABCOCK & WILCOX COMPANY
TUBULAR PRODUCTS DIVISION
Beaver Falls, Pa.—Seamless Tubing; Welded Stainless Steel Tubing
Alliance, Ohio—Welded Carbon Steel Tubing

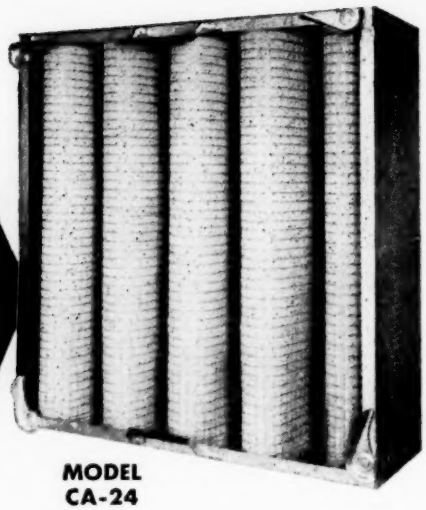
TA-1794(A)

ANNOUNCING

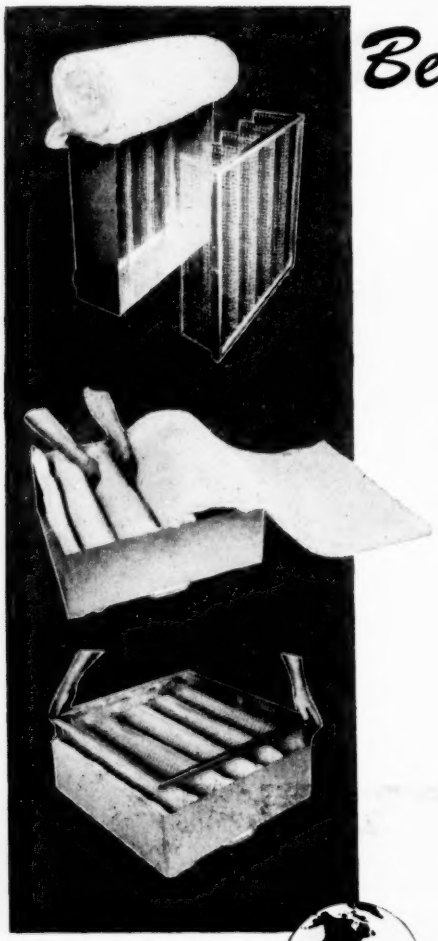
NEW... DIFFERENT

DYCON

DRY AIR FILTER



MODEL
CA-24



Beats all for: ECONOMY
EFFICIENCY
MINIMUM MAINTENANCE

Vacuum it! Wash it!

At last, here's a different kind of dry air filter with high efficiency, large dust-holding capacity, and low maintenance factor. The virtually permanent Dycon filter media — consisting of a thick blanket of specially prepared synthetic fibers — has approximately 4 times the dust-holding capacity of other widely-used dry air filters of similar size and efficiency.

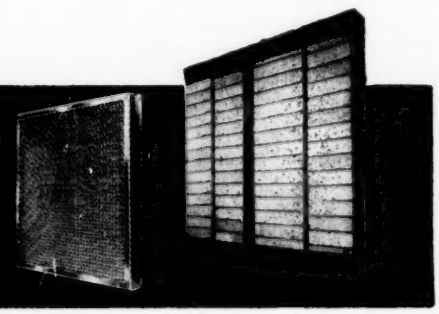
When finally dust-laden, Continental's CA-24 Dycon filter can be restored quickly to like-new efficiency by vacuum cleaning, or washing with a cold water hose. No oil is involved.

Write today for more detailed information — ask for Bulletin 501-B.

CONTINENTAL

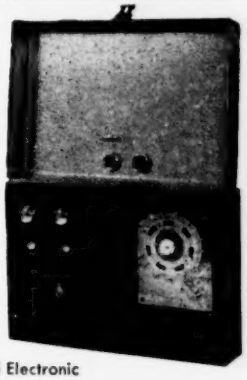
P. O. BOX 1647 LOUISVILLE 1, KY.

CONTINENTAL AIR FILTERS Inc.



MAXIMUM STEAM SAVINGS ASSURED WITH JOHNSON CONTROL

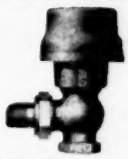
T-403 Single Temperature Room Thermostat



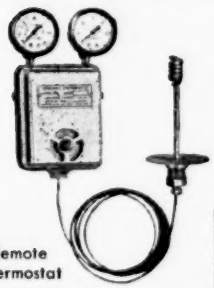
T-385 Electronic Duo-Stat

T-460 *Dual* Two Temperature Room Thermostat

T-901 Submaster Thermostat



V-111 Radiator Control Valve



T-800 Remote Bulb Thermostat

V-103 Coil Control Valve

V-160 Convector Valve

Why do engineers, who insist that only the best is good enough for their heating, ventilating and air conditioning systems, recommend Johnson Control? Simply because they know that they and their clients are best served when the temperature control apparatus is manufactured and the complete system *planned* and *installed* by the same organization!

They know that, when an organization is devoted exclusively to manufacturing, planning and installing automatic temperature control systems, there can be no division of responsibility. The system must fit exactly the needs of the specific heating, ventilating and air conditioning problems which are encountered.

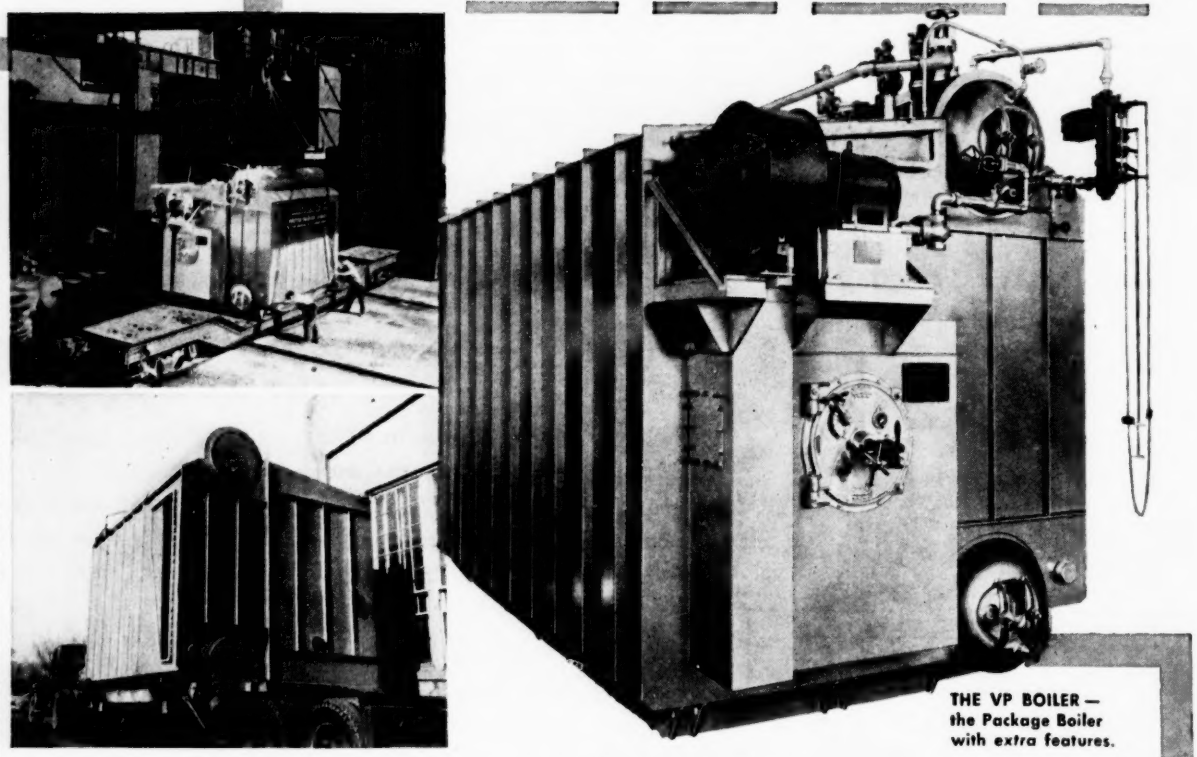
Ask a Johnson engineer from a nearby branch office for recommendations on any temperature control problem—large or small—in both new and existing buildings. There is no obligation. JOHNSON SERVICE COMPANY, Milwaukee 2, Wisconsin. Direct Branch Offices in Principal Cities.

JOHNSON *Automatic Temperature and Air Conditioning* **CONTROL**

MANUFACTURING • APPLICATION • INSTALLING • SINCE 1883

4 reasons why...

THE VP PACKAGE IS YOUR BEST BOILER BUY



THE VP BOILER — the Package Boiler with *extra* features.

1 Fully Water-Cooled Furnace — More cooling area per cubic foot of furnace volume than any other boiler of the VP's size and type. In all but the three smallest sizes, the VP Boiler has water-cooled walls on *all six sides* — including the burner wall. Assures rapid, efficient heat absorption. Minimizes furnace maintenance.

2 Larger Lower Drum — The 30 in. diameter lower drum permits a simple, symmetrical tube arrangement . . . provides easy access for washing down or inspection . . . its greater water storage capacity facilitates the handling of fluctuating loads.

3 Simple Baffle Arrangement — Minimum changes in direction — no baffle at all in convection bank in larger VP Boilers. This means lower draft loss . . . simplified soot blowing . . . elimination of dead pockets, thus, maximum heat pick-up. In the intermediate sizes, a water-cooled baffle assures minimum maintenance.

4 Centrifugal Fan — This more efficient type of fan operates at lower speed than other types and is quiet in operation. In fact, its average noise level is less than half that of typical high-speed blowers used in most package boilers.

These four *extra* features are yours *only* in the VP Boiler which is designed and manufactured by Combustion — maker of many of the world's largest boilers. These units are available in capacities ranging from 4,000 to 30,000 lb of steam per hr, and pressures up to 250 psi.

Complete details on the C-E Package Boiler, Type VP, are available to you. Send for your free copy of Bulletin VP-191. B-666B

COMBUSTION ENGINEERING, INC.

200 MADISON AVENUE, NEW YORK 16, N. Y.

ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS

The fittings that revolutionized pipe welding . . .

In the year 1931 Taylor Forge gave industry its *first real line* of seamless, butt-welding pipe fittings. We say it was the first *real* line because it was the first to include not only long and short radius ells, but also full branch and reducing tees, concentric and eccentric reducers, stub ends, caps and welding neck flanges.

This was a fully planned development. Many years before Taylor Forge had foreseen the future of the butt-welding fitting . . . had realized that pipe welding could not go beyond its then crude stage until pipe users were given *all* the fittings necessary to make up complete piping systems.

So Taylor Forge went to work on this and after long research and development came out with the full line that became the inspiration of modern pipe welding.

Naturally the organization that started ahead has kept ahead . . . in design, in quality, in breadth of line. That is why so many men who have followed the development of the WeldELL line, refuse to consider any other kind of welding fittings.

TF

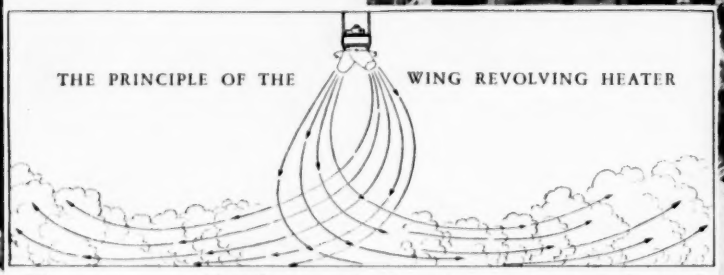
For up-to-the-minute facts, see your Taylor Forge distributor

TAYLOR FORGE

TAYLOR FORGE & PIPE WORKS, General Offices and Works: P.O. Box 485, Chicago 90, Ill.
Offices in all principal cities. Plants at: Carnegie, Pa.; Fontana, Calif.; Hamilton, Ont., Canada

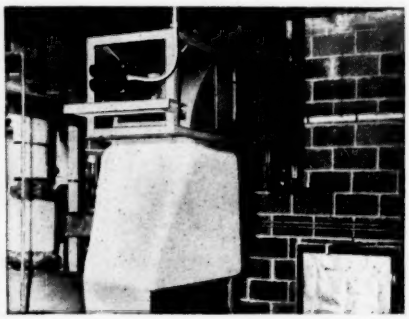
HEAT THAT MOVES AROUND

THE fact that the discharge outlets of WING Revolving Unit Heaters keep the heated air in constant, gentle motion is one of the reasons why nationally known firms like the Budd Company have installed them in their plants, both at Philadelphia and in the one shown in this photograph, at Gary, Indiana. The big blanking and forming presses in this great plant present a natural barrier to ordinary fixed discharge heating systems, but not to the moving streams of heated air from the WING Revolving Heaters, even suspended, as they must be, far above the floor, to clear the cranes. That is equally true in the summer time when, with steam turned off, the cooling breezes from the revolving discharge outlets keep workers comfortable on the hottest days. Investigate. Write for Bulletin HR-6.



The moving streams of heated air (or cooling breezes in summer) sweep slowly around through 360 degrees, covering successively every direction. The air velocity is sufficient to carry to walls, and remote corners and the constantly changing direction of flow causes the air to find its way around obstructions.

MOTORIZED CHIMNEY DRAFT



with the WING DRAFT INDUCER

No boiler can operate satisfactorily or efficiently over wide ranges of weather or load with variable natural draft. The fuel—whether oil, gas or coal—must have enough oxygen for complete combustion. There must be sufficient draft or furnace fires will be slow burning and lifeless, resulting in uneven, insufficient and irregular heat.

WING Draft Inducers insure positive, adequate, uniform draft regardless of variable weather conditions or inadequate chimney or breeching construction.

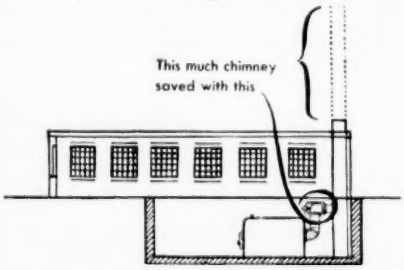
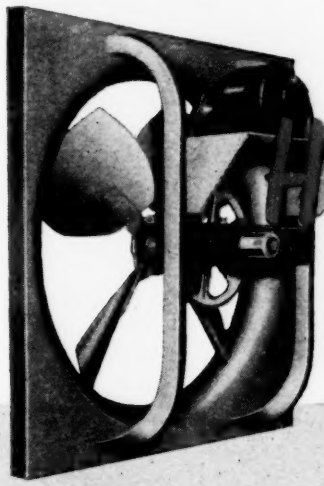


Diagram above shows how much chimney is saved by installing Wing Draft Inducers.

Wing Draft Inducers are suitable for use in connection with oil, gas, stoker-fired or hand-fired heating boilers, industrial furnaces or kilns, or high pressure steam boilers, either stationary or marine. Sizes are available for boilers as low as 1000 sq. ft. E. D. R. up to steam generators producing 100,000 pounds of steam/hr. Special, heavy duty designs available for these larger boilers.

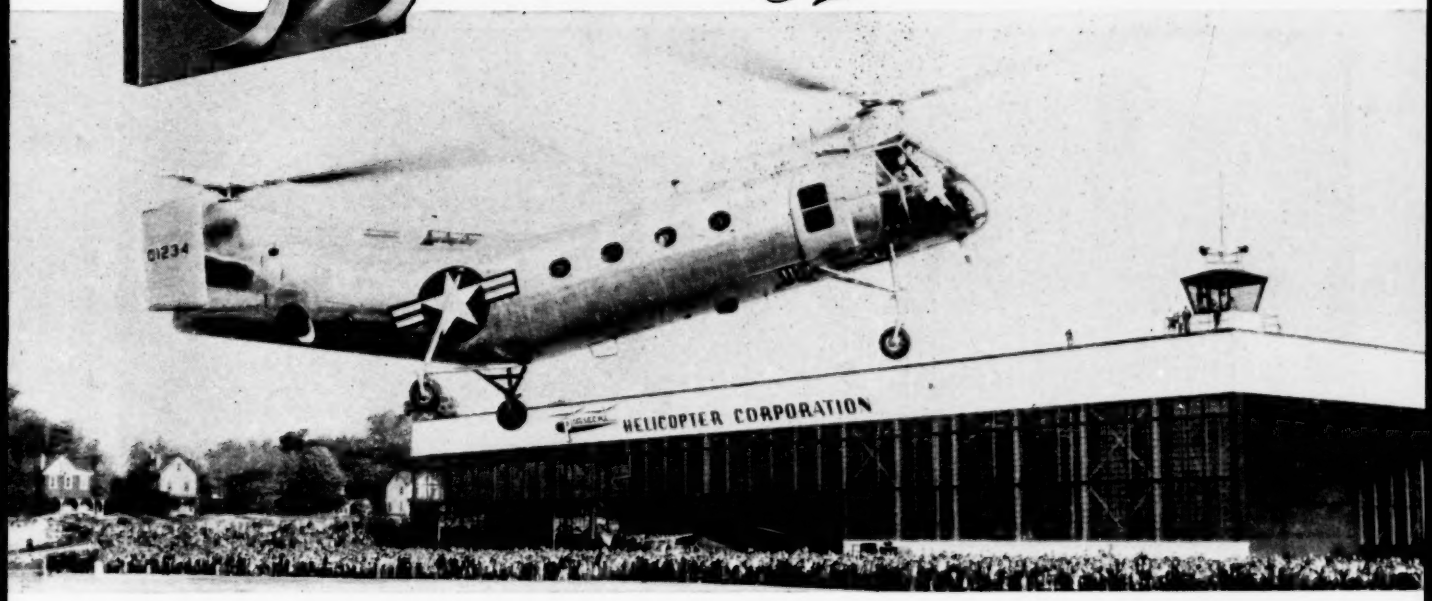
Wing Draft Inducers are made in two types—for insertion in breeching or flue, or for installation on top of a chimney. Write for a copy of Bulletin I-52 to L. J. Wing Mfg. Co., 158 Vreeland Mills Road, Linden, New Jersey.



High-Performance Blades!

—on these world-famous helicopters

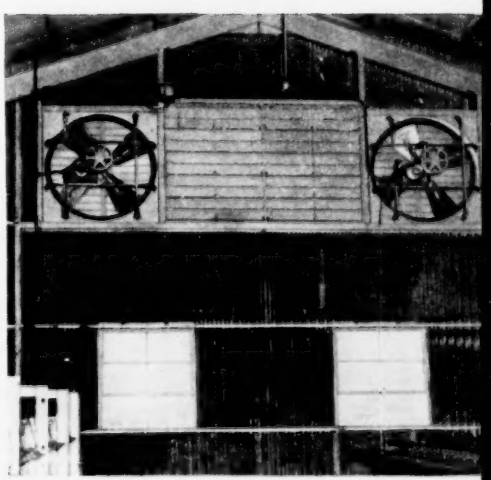
and the "Buffalo" FANS in their plant



Out of the heat treat building of the Piasecki Helicopter Corporation in Morton, Pa., come precision-made parts like the rotor blades raising this big, new Piasecki H-21 "Work Horse" Helicopter.

Doing another "Work Horse" job in that building are other blades—the wheels of the "Buffalo" Heavy Duty Belt-Air Fans constantly exhausting the hot air from the process. In these blades, as in helicopter blades, balance must be perfect for freedom from vibration. Blade shape must be for high efficiency, that is, most delivery on least power. Overall construction must be extremely rigid and strong. "Buffalo" Belt-Air Fans fulfill these conditions to perfection.

If you have an air moving job from 4,000 cfm to 90,000 cfm and up to 1" pressure, your best and lowest cost solution may well be one of these rugged propeller fans. Why not write for literature today?



"Buffalo" FIRST FOR FANS

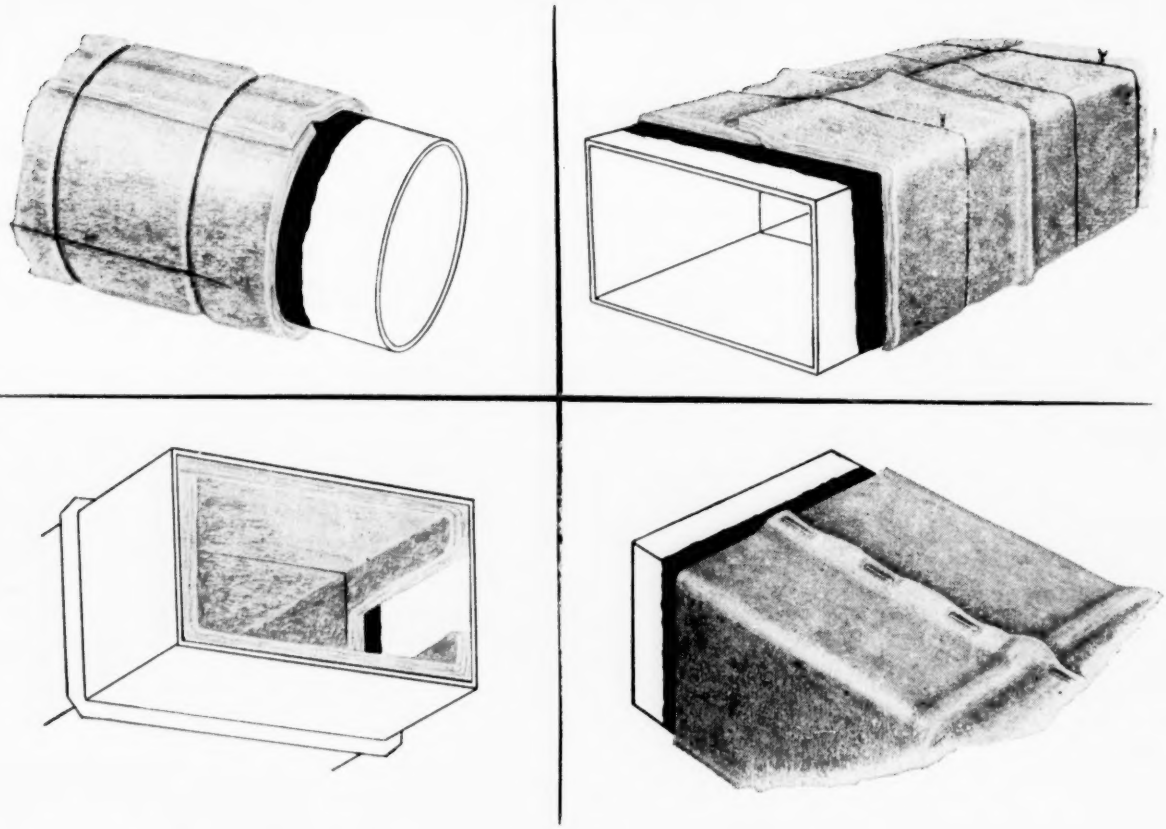
BUFFALO FORGE COMPANY

480 BROADWAY BUFFALO, NEW YORK

PUBLISHERS OF "FAN ENGINEERING" HANDBOOK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont. Sales Representatives in all Principal Cities

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING
FORCED DRAFT COOLING HEATING PRESSURE BLOWING



L·O·F Super·Fine Fiber·Glass is highly flexible, conforms to duct surface, around irregular contours or projections. Easy to handle, easy to cut, easy to apply.

How to do a first-class insulating job on cooling and heating ducts

FIRST, use L·O·F Super·Fine Fiber·Glass. It's exceptionally efficient, needs little space. On heating ducts, it cuts heat loss sharply, saves fuel. On cooling ducts, it saves power, boosts over-all efficiency of system. As a duct liner, *faced* Super·Fine reduces sound of motors and blowers. And it lasts. Inorganic glass fibers won't burn, won't rot, won't absorb moisture. They're verminproof.

With L·O·F Super·Fine, you can give your customers first-class long-lived insulation jobs that back up your reputation for careful workmanship.

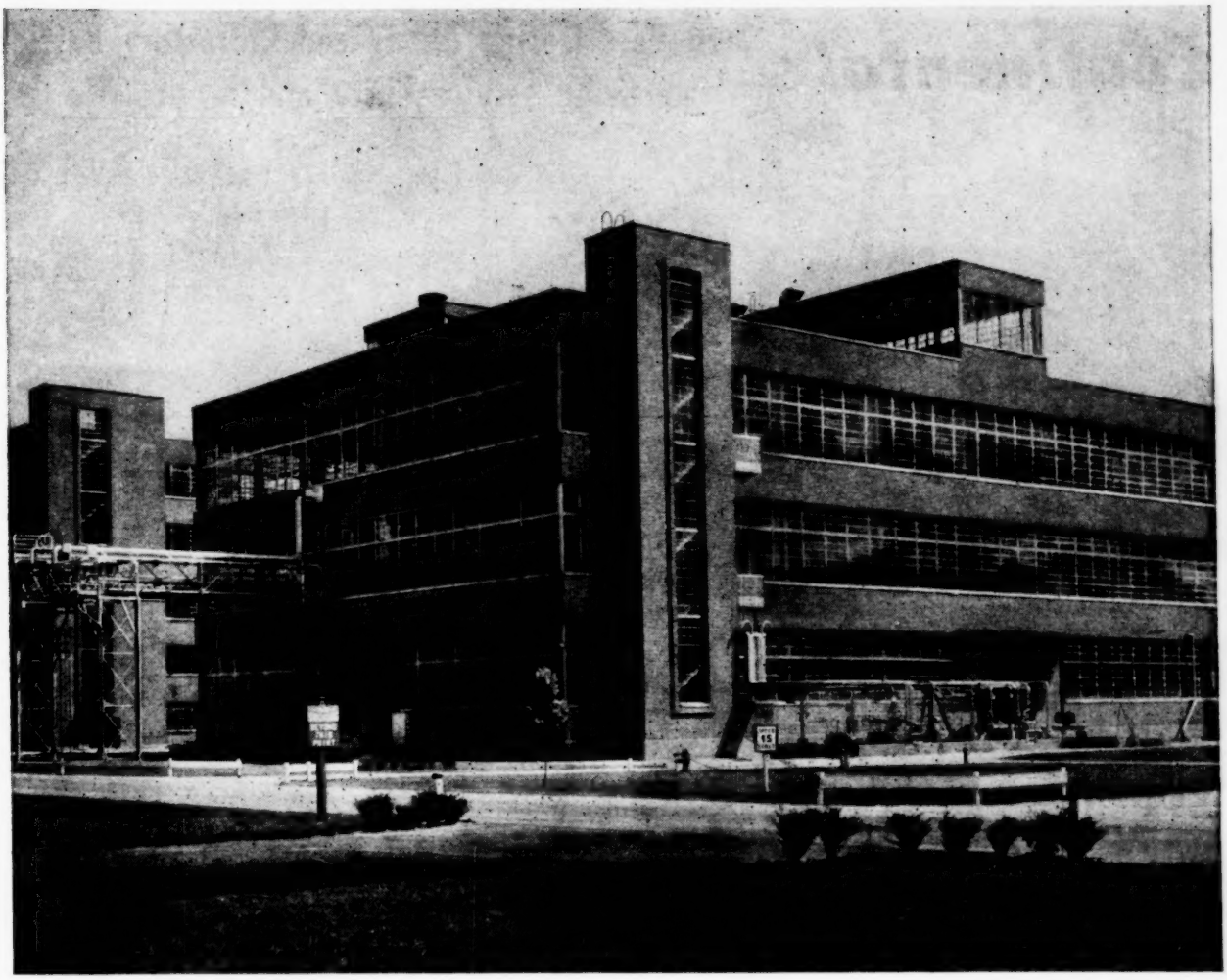
SECOND, send for free L·O·F folder on metal-air duct installations. In four meaty pages, it gives you helpful pointers about L·O·F Super·Fine's insulating and sound absorption properties, recommended installation steps, specifications, standard shipping sizes and other data.

FREE! Send for helpful installation folder. Libbey·Owens·Ford Glass Company, Fiber·Glass Division, 31113 Wayne Building, Toledo 3, Ohio.

LIBBEY·OWENS·FORD GLASS COMPANY
FIBER·GLASS DIVISION

L·O·F GLASS · Corrulux · FIBER·GLASS

FIBER·GLASS



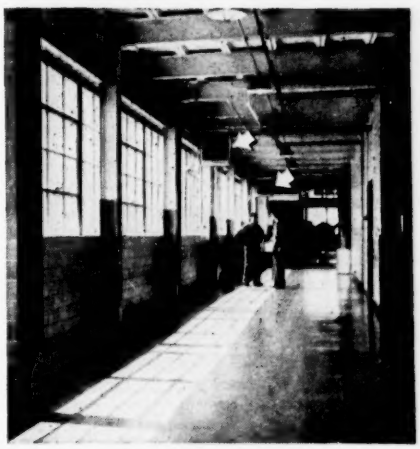
Wind and sun load don't affect working conditions here.

UNIT HEATING
SAVES FUEL COST

How do you economically heat a plant where the walls have more glass area than brick? That can be a real problem. Constantly changing wind and sun loads cause a central-plant system to overheat and underheat.

But the Tom's River Division of CIBA STATES LIMITED found the answer with unit heaters. They installed 200 Westinghouse Speedheaters throughout their three large buildings. The Speedheaters supply heat only as required. For CIBA: acres of sunlit workspace, winter comfort control, economical heating with low investment.

Are you building new quarters? Are your heating costs high? You'll save money with Westinghouse Speedheaters. Install them today. Write for Catalogs 1521 and 1525. Westinghouse Air Conditioning Division, Hyde Park 36, Massachusetts.



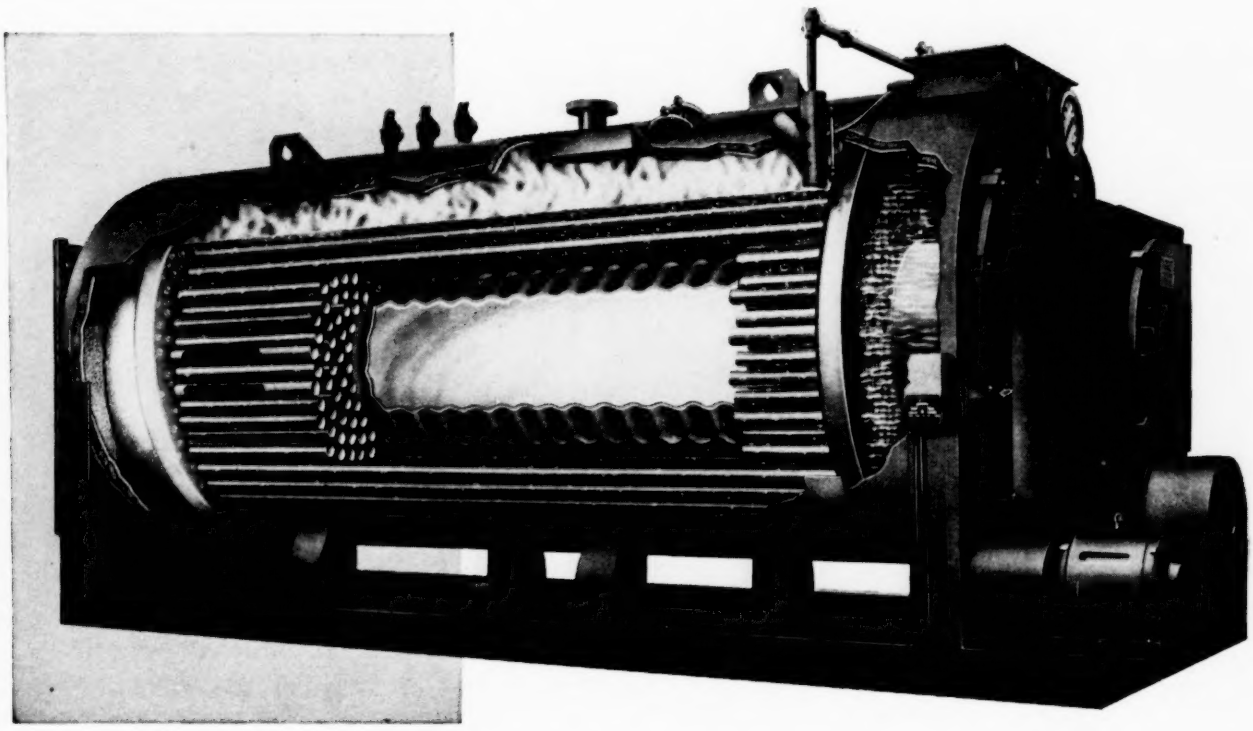
Westinghouse Speedheaters blanket large window areas. Separate control for each area provides the most efficient heating. Fan-driven air results in uniform temperatures throughout.

WESTINGHOUSE SPEEDHEATERS

YOU CAN BE SURE... IF IT'S **Westinghouse**

J-80339

Continental's Two-Pass Design Eliminated Refractory Baffles – improving serviceability and service life



What is the Continental?

It is a self-contained, automatic steam generator . . . a horizontal fire-tube type boiler which features *two-pass design.* Continental Boilers—for high or low pressure, oil or gas (or combination) fired—range from 20 to 500 hp.

What is the value of Continental's two-pass design?

The result of research, prolonged tests, and a number of years of field operation, Continental's two-pass design made it possible to simplify boiler construction and improve durability. The design eliminates the need for refractory baffles or partitions in front and/or rear (which in time may be subject to burn-out or leakage and short-circuit of gases) and provides easy and full access to all fire surfaces. Also, since all return tubes are arranged to do the same amount of work (are subjected to the same temperature), Continental's two-pass design affords more uniform longitudinal expansion of the entire structure of the pressure vessel.

What are other important Continental features?

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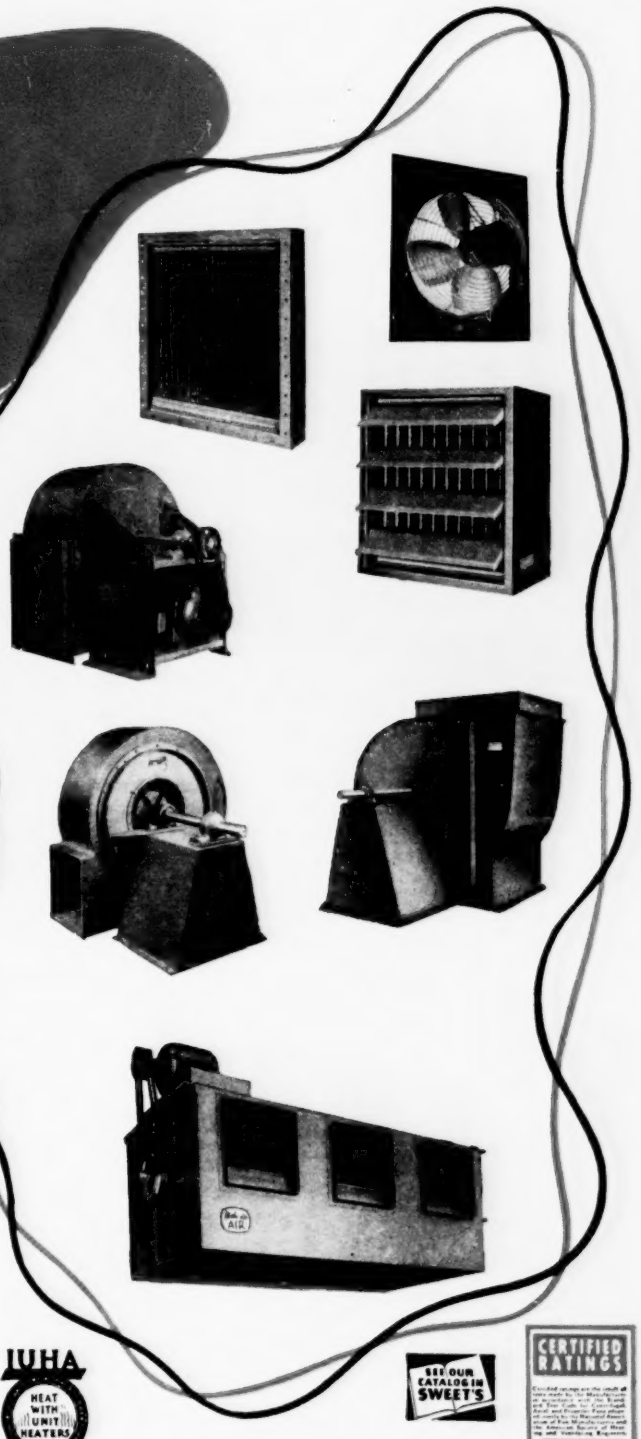

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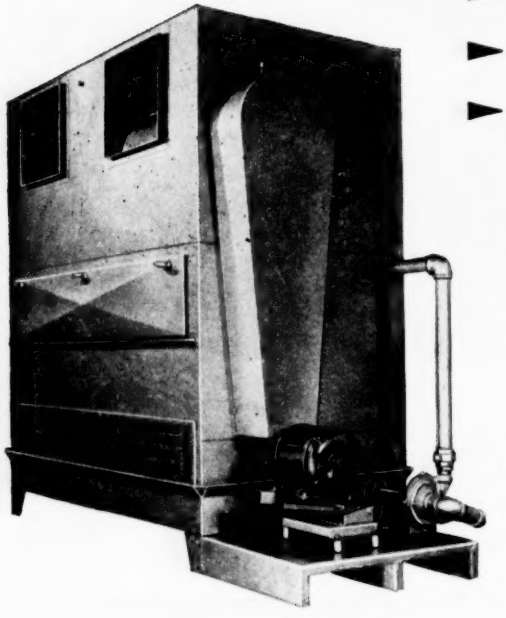

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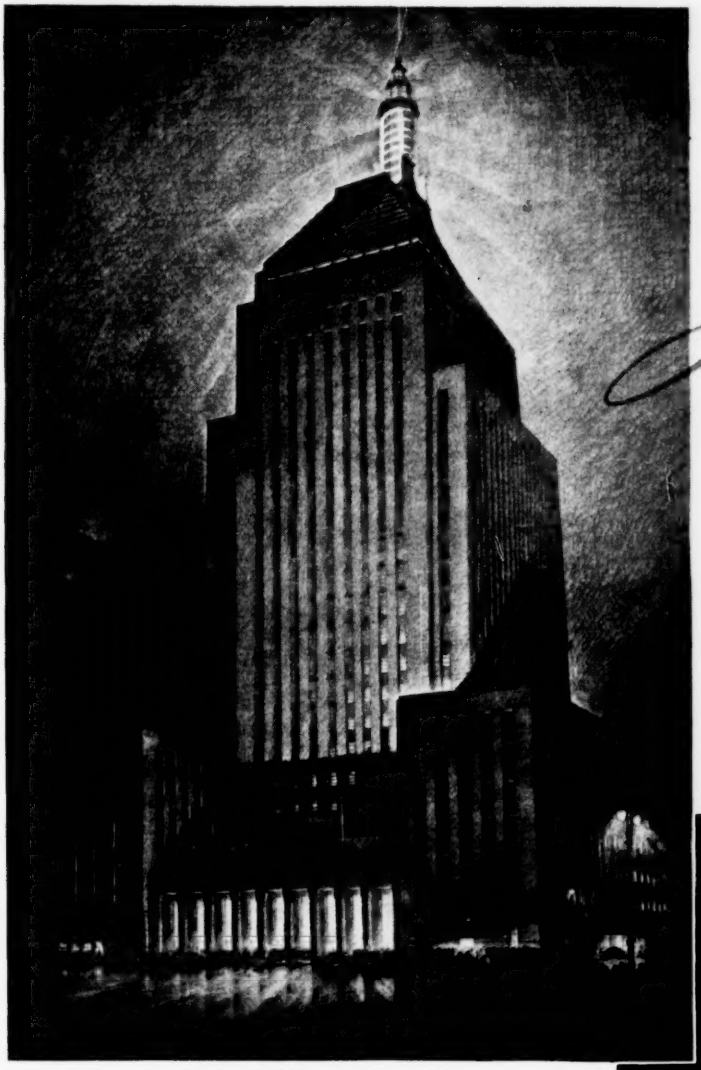

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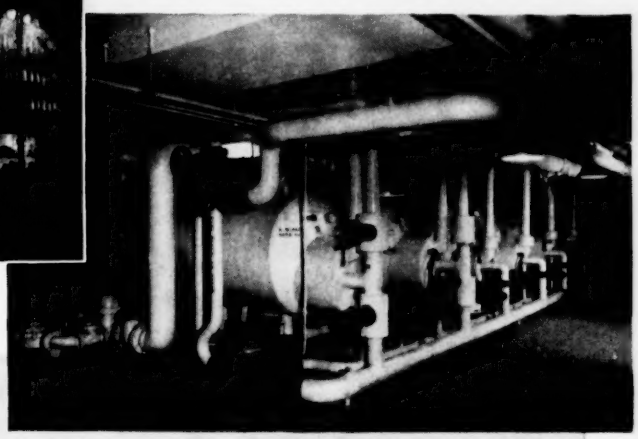

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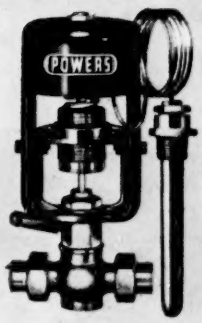

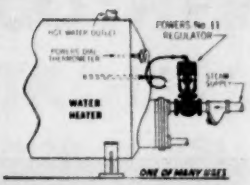

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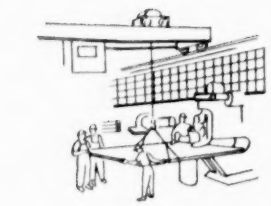

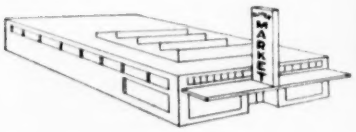

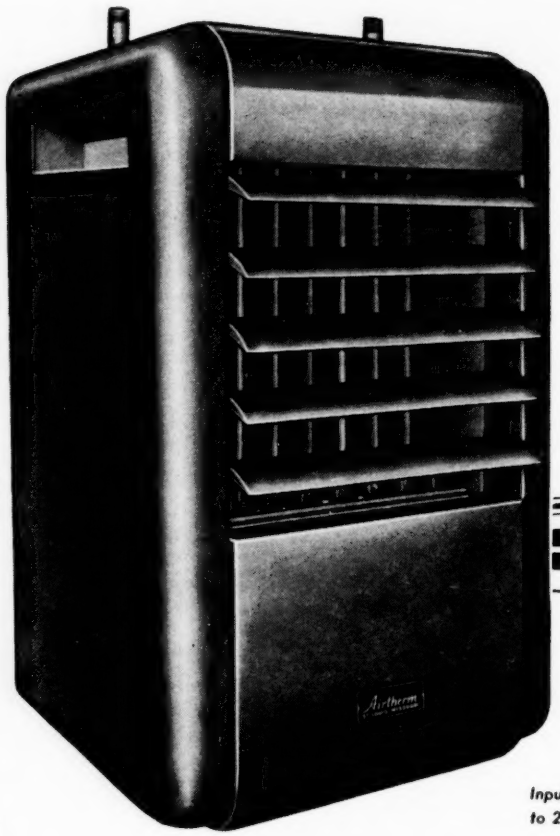

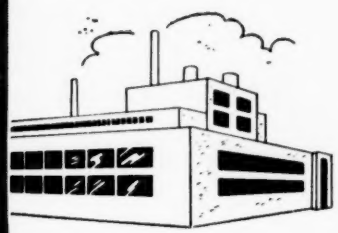

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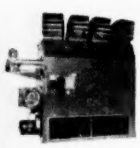

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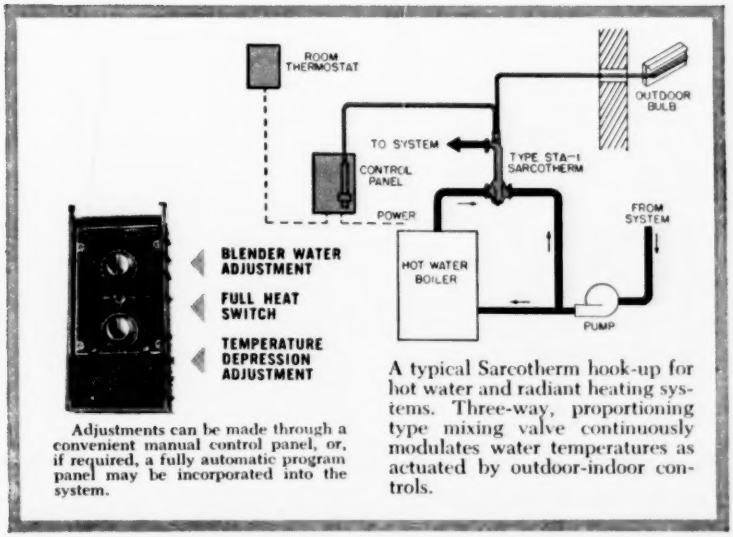

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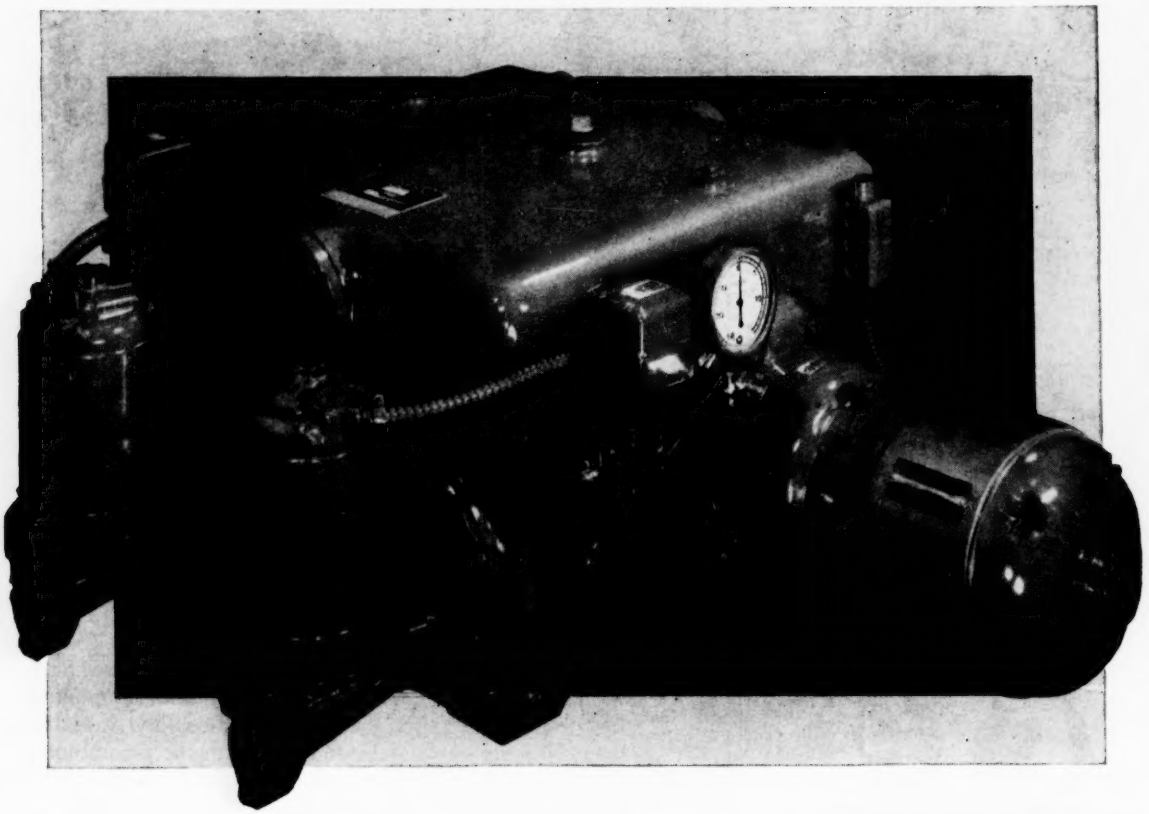

It's the Nash CSM

Designed and manufactured by the organization that made the Jennings Manifold Heating Pump standard of the Heating Industry, the new CSM incorporates every desirable feature architects, engineers, owners and operators have sought. Employing separate air and water pump elements, each with its own motor and each independently controlled by its own automatic switch, the capacities and arrangement may be widely varied to meet job conditions. For the first time, the engineer has the choice of realistic water and air capacities required for rapid system response without wasteful overheating.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- Increased air capacity induces rapid system response without wasteful overheating.
- Separate air and water pumps individually selected to meet actual job requirements.
- Control system that operates individual pumps only when needed.
- Flexibility permitting addition of radiation without changing basic pump installation.
- Low, low, return line connection.

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Miami Valley Laboratory for the Procter and Gamble Company

Details of the air conditioning, heating and fire protection systems, as well as the system of process piping installed in the research and development laboratories. Building was designed by F. A. Fairbrother and George H. Miehls; Albert Kahn, Associated Architects and Engineers, consultants.

THE Procter and Gamble Company recently dedicated its new Miami Valley Laboratories located in Colerain Township, Hamilton County, Ohio, approximately 17 miles northwest of Cincinnati. This multi-million-dollar research laboratory, reputedly the largest of its kind in the country, provides additional facilities for expanding basic research and development work.

The site is a tract of approximately 250 acres of rolling and heavily wooded land affording an ideal location for a structure of this nature. The building is situated on a small level plateau overlooking the Miami River.

The building was designed by F. A. Fairbrother and Geo. H. Miehls, Architect and Engineer, with Albert Kahn Associated Architects and Engineers of Detroit as consultants. A basement and two-story structure provides approximately 127,000 sq ft of floor space and houses research and development laboratories, engineering and administrative offices, and pilot plant. The modified U-shaped plan of the structure was dictated by the owners' requirements and provides for expansion of each department housed, either separately or in any combination required to meet future needs.

The central wing of the U-shape plus an extension to the northerly wing, houses the engineering and administrative offices. The research laboratories are in the northerly wing, and the development laboratories and pilot plant are in the southerly wing. In the interior court formed by the U are the boiler room and incinerator.

The building basement contains the necessary storage and supply rooms, equipment rooms, maintenance shops, a large recreation room, meeting room, and kitchen and dining areas. Although the dining room and recreation room are on the basement level, due to the topography of the land, each is entirely above grade which permits a view of the river.

The exterior of the building is finished with a variegated red brick with limestone and Crab Orchard stone trim. The interior finishes in the engineering and administrative offices conform to the owners' standards of plaster walls, metal acoustic ceilings, and rubber tile floors with composition bases.

In the laboratories the walls are of ceramic glazed

hollow tile constructed in such a manner as to allow one series of service mains to serve two laboratories. The floors are rubber tile and the ceilings are of exposed concrete construction. A series of furred shafts outside each laboratory permits easy access to mechanical services for easy maintenance and flexibility.

All laboratories are furnished with the most modern equipment available, and in each one the equipment is arranged, and in many cases specially designed, to suit the specific requirements of its occupancy. Each laboratory has on tap gas, air, and nitrogen, besides hot, cold, and distilled water and steam. One wall of each room has a fiber-board panel emergency exit, easily shattered in the event a dangerous condition develops. In addition to the regular laboratories there are a special tracer room, in which radio-active materials are handled, and a high-pressure room—the latter walled with boiler plate and so constructed that an explosion would blow off the roof but leave the rest of the building intact.

The pilot plant, of steel frame construction, is nearly 22 ft high to the underside of the trusses, has a concrete floor and glazed hollow tile walls to window sill height. Part of the roof is constructed to serve as an outdoor work deck; adjacent to this is a completely equipped machine shop. Direct access has been provided to the pilot plant from the development laboratories on both first and second floors.

Adequate toilet, locker, and shower facilities for all occupants are located on each floor. These are designed for ease of maintenance, have glazed tile walls, terrazzo floors, and metal pan ceilings. All lockers are set on terrazzo bases and are furred in at the top. The toilet fixtures are wall hung and the toilet partitions are hung from the ceilings to free the floors of all obstructions, a feature which reduces maintenance costs.

All working and recreational areas are completely air conditioned, and all other areas adequately ventilated. The fan room is located on the roof of the building and this room is U-shaped so that it follows the line of the inner court.

Heating

The building is served by two separate types of heating systems which work in conjunction with the air conditioning system.

The pilot plant, garage and receiving rooms are heated by unit heaters supplied with a medium pressure steam and return piping system, and the laboratory and office areas are heated by a system of forced hot water with concealed piping supplying convector radiation enclosed in built-in recesses.

The hot water system is divided into two zones, one for the north and one for the south with a water heater and circulating pump for each zone and a spare unit which can be cut into either system. Each of these systems is automatically controlled by an outdoor stat and a bulb in the hot water supply which regulates the temperature of the supply water in relation to the outside temperature.

The steam lines supplying the various pieces of the heating equipment also supply the owners' process requirements. Condensate returns from all sources flow by gravity to condensate pump and receiver units which return the water to the boiler house.

Air Conditioning

Areas of the building for which air conditioning is provided include: (1) research laboratories; (2) development laboratories; (3) offices; (4) dining room, recreation room, and meeting room; (5) maintenance shops and offices, and all toilet rooms. The air conditioning system was divided into separate units serving these areas in order to prevent transfer of odors from one section to another and to permit operation in part of the building when the remainder is not in use.

A chemical dehumidification air conditioning system was selected as the most economical, practical and satisfactory for the Miami Valley Laboratories on the basis of first cost, simplicity of operation, ease of installation in a building of this type and construction, and flexibility to meet changing requirements. The system makes use of well water from nearby wells for all sensible heat removal. All latent heat removal is accomplished with chemical dehumidifying units which are secondary users of the well water from the cooling coils.

The general building air conditioning system is designed to maintain indoor conditions at 80F DB with 50 per cent relative humidity in summer and 72F with 40 per cent relative humidity maximum in winter.

Because of the nature of the work performed in them, special air conditions were established for some of the research areas including the animal room, spectro laboratory, and the tracer laboratory which contains equipment for handling radio-active materials. These areas are served by their own air conditioning systems which use direct expansion refrigeration equipment and require continuous operation, while the general building systems run only eight hours per day.

Ventilation only is provided for the pilot plant the year around.

Mechanical Services to Laboratories

Since dynamic research is the study and investigation of ways and means to improve present products or to discover new ones which will add to the enjoyment of the future, it can never be static, but must always be of a flexible nature. The mechanical systems serving a laboratory dedicated to such a purpose must likewise be flexible to meet the unceasing changes and demands of basic research developments.

Process piping systems originating in the basement and fan room consist of cold water, hot water, process water, natural gas, compressed air and steam, demineralized water, distilled water, low and high pressure nitrogen, and hydrogen. Pipe shafts between the basement and fan room provide accessible space for the installation of these service mains from which branch lines are extended into the walls of each laboratory in such a manner that secondary branches may be extended to outlets on the chemical benches which are adjacent to these walls.

Any of the several piping services may be extended into each laboratory as present or future needs may require. Provision for additional services such as controlled hardness water and others can be installed and extended to any of the laboratories where desired without unduly disrupting the work being carried on in the laboratory. The flexibility designed into the structure for first floor

laboratories applies equally well to the laboratories located on the second floor. The service to each laboratory is separately valved in the pipe shaft so that changes within any laboratory can be made without affecting the work in any other laboratory.

Fire Protection System

Automatic fire protection is provided by means of automatic sprinklers throughout the pilot plant, maintenance shops, paint rooms, storage areas, incinerator room, the garage area, automatic oil filter units within the fan room, and miscellaneous rooms housing combustible materials. Portable fire protection is available for fighting fires by means of small combination hose assemblies connected to the overhead sprinkler supply mains.

The primary water supply to the fire protection systems consists of a dual service elevated water storage tank and deep well pumping units located at an off-site pumping station. The exterior yard protection consists of fire hydrants connected to the underground fire mains looping the property.

Where hazardous conditions exist, such as in the basement solvent and alcohol storage rooms, an automatic system with manual control, two "shot" (reserve) carbon dioxide fire extinguishing system supplements the water protection, completing a comprehensive combination of fire protection equipment to minimize loss or damage due to smoke and fire.

The handling of flammable products in the laboratories and the possibility of overheated ducts and ovens were deemed fire hazards requiring the installation of a completely automatic supervisory system. Consequently, a heat detector device which will open a signal circuit when the temperature in any area rises to a predetermined dangerous level is installed in each laboratory and other hazardous locations.

The entire building is divided into five zones. When the temperature rise causes the circuit to open, it actuates a visible and audible signal in the boiler house at the operator's station indicating the location of the trouble in order that the operator can instantly dispatch properly equipped personnel to cope with the condition. Spread of fire from laboratory to laboratory within the zones is prevented by special damper operating controls located in the duct work in the individual laboratories.

Boiler Room

Located in the interior court formed by the U-shaped plan of the structure, is the boiler room which houses two combination gas and oil-fired type FF boilers operating at 150 psi and designed for 200 psi. Each has a capacity of 20,000 lb. per hr.

Water is pumped to the boilers from an open deaerating feedwater heater by means of a turbine driven centrifugal boiler feed pump. A motor driven pump is provided as a spare. Makeup water is from nearby wells and is treated in the boiler room by means of sodium-hydrogen zeolite equipment with control of pH through caustic feed equipment.

Combustion air is from motor driven forced draft fans through ducts under the furnace floors to the burner windboxes. Products of combustion are removed from the boilers and a small incinerator by means of lined steel plate breechings and through a 135-foot high brick stack.

A corner of the library in the research building showing the ceiling treatment.

For emergency power to keep certain lighting and one boiler in operation in the event of power failure, a package type 100 kw diesel generator set is included in the boiler room equipment.

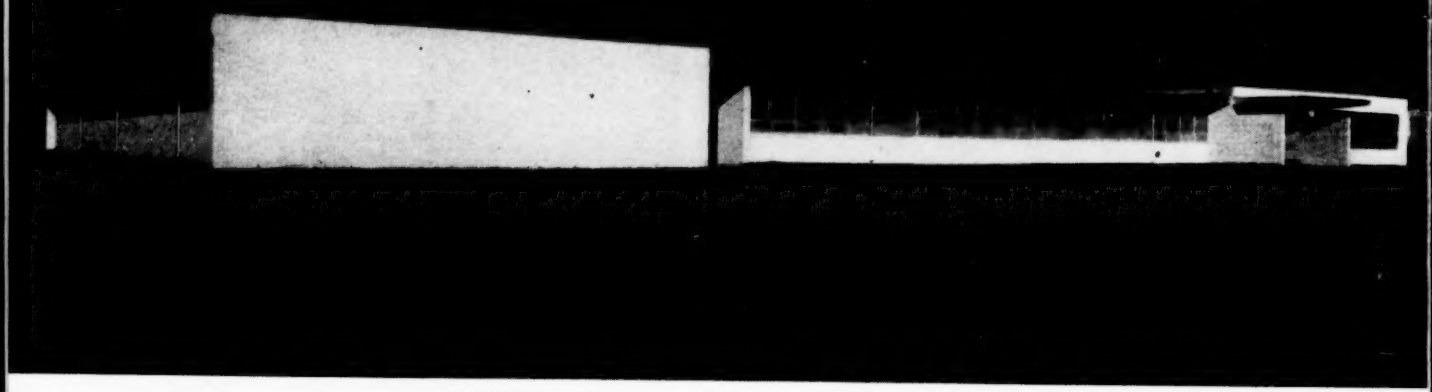
Industrial Waste Treatment Plant

Waste waters from this plant are divided into four categories; namely, storm, sanitary, process and acid wastes. Separate sewers are provided for the collection of each type of waste. The storm water sewer discharges directly to the Great Miami River. Sanitary, process and acid wastes are separately conveyed to the industrial waste treatment plant.

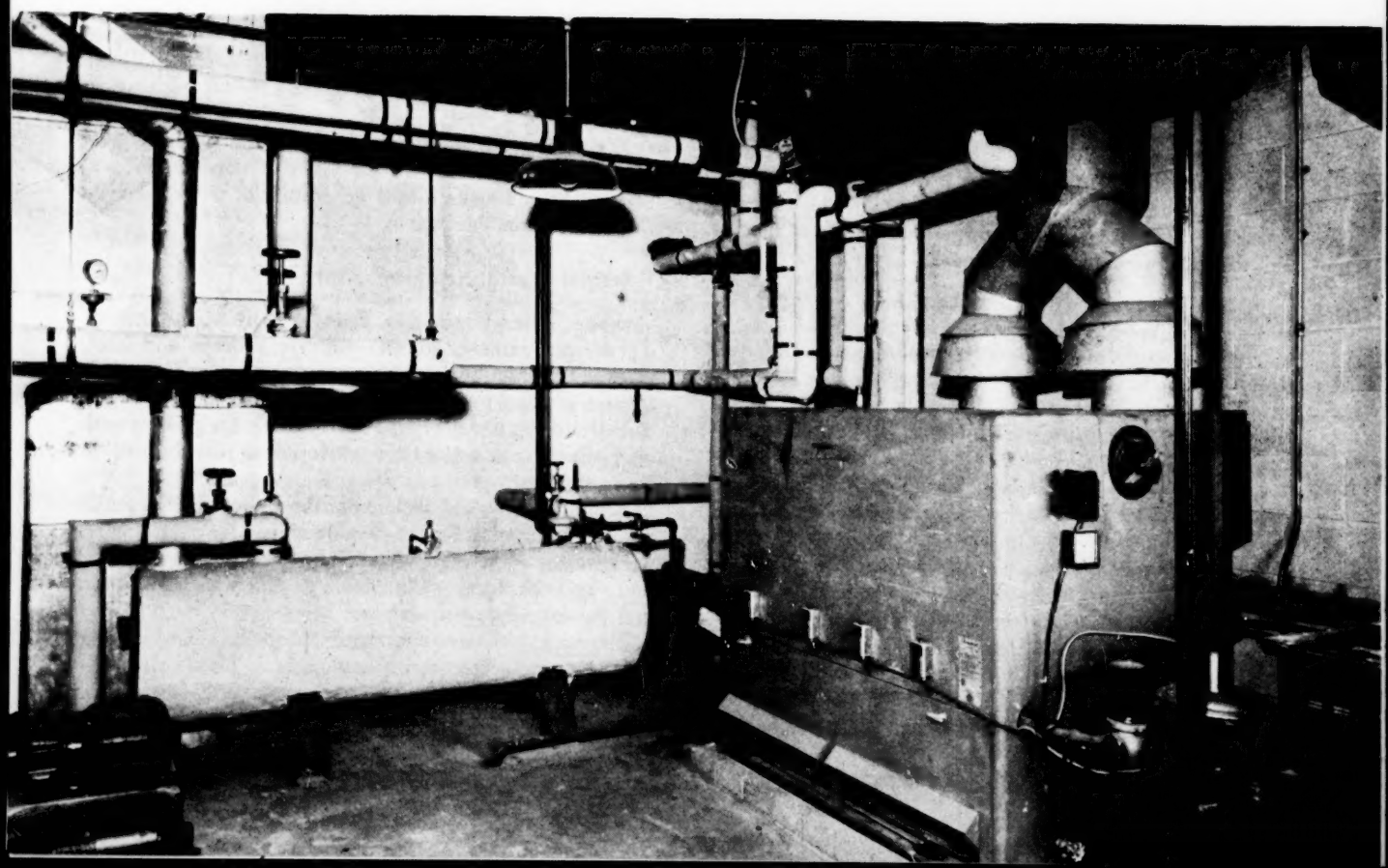
Sanitary wastes are disposed of through an Imhoff tank. Two batch treating basins provide means for neutralizing acid wastes which result from glass washing operations and the back wash waters from zeolite water softeners and demineralizing equipment.

The process wastes consist of all alkali, soap and detergent wastes. A large holding basin is provided to receive these wastes and permit the skimming of free oil and grease before the effluent is discharged to the river.

Air Conditioning a Laboratory-Health Center



(Above) The laboratory of the Alexandria-Rapides Parish Health Center Building is at the left and the health center wing at the right of the photograph. (Below) Boiler room before the cooling equipment was installed. Shown are the heating boiler, the service water heater, and two pumps. The boiler room is located adjacent to the health center area.



Two separate air conditioning systems, one a chilled water system and the other direct expansion, were designed to best serve the two distinct wings of this building. The air conditioning was added after the warm air design was completed.

WARREN G. MOSES

Partner, de Laureal & Moses, Consulting Engineers, New Orleans, La.

A COMPLETE year-round air conditioning system is installed for all the occupied areas in the new Alexandria-Rapides Parish Health Center Building, Alexandria, Va. Although the building is owned by the city, it has actually two separate operators: The State of Louisiana Department of Health pays all expenses for the operation of the laboratory wing and the City of Alexandria supports the health center area.

The laboratory wing houses a general office, technologist offices, glassware washroom, sterilization room, media preparation room, serology laboratory, bacteriology laboratory, microscopic room, water room and a milk room.

The health center wing houses administrative offices, an assembly room and an X-ray suite.

Separation of Systems

As the two year-round air conditioning systems were to be kept entirely separate it was possible to design each area of the building with a type of system uniquely suited to the application. At the time of original design and construction, insufficient funds existed to provide for the addition of cooling to make a year-round air conditioning system. The design was produced, therefore, as a warm air heating system capable of being converted to a year-round air conditioning system and the conversion was accomplished before the building was completed.

The air conditioning systems are entirely separate. The systems maintain 78F dry bulb and 50% relative humidity in summer when outside conditions are 97F DB and 79F WB. In winter, the outdoor design temperature is 10F.

Laboratory System

The laboratory area with two air conditioning units is remotely located from the boiler room. A chilled water system serves these units through a packaged water chilling unit located in the boiler room. Chilled water piping is extended to the units. Each of the two units is connected to a system of ductwork and is controlled independently, providing east and west zones to the area. Two rooms in the laboratory area that are subject to disagreeable odors are provided with exhaust systems which remove all of the entering air after it has accomplished its cooling or heating. Makeup air is supplied by an outside air intake at each unit. In addition, a sterilization room that has a very intense heat load is provided with independent ventilation and is not part of the air conditioning distribution system.

Health Center System

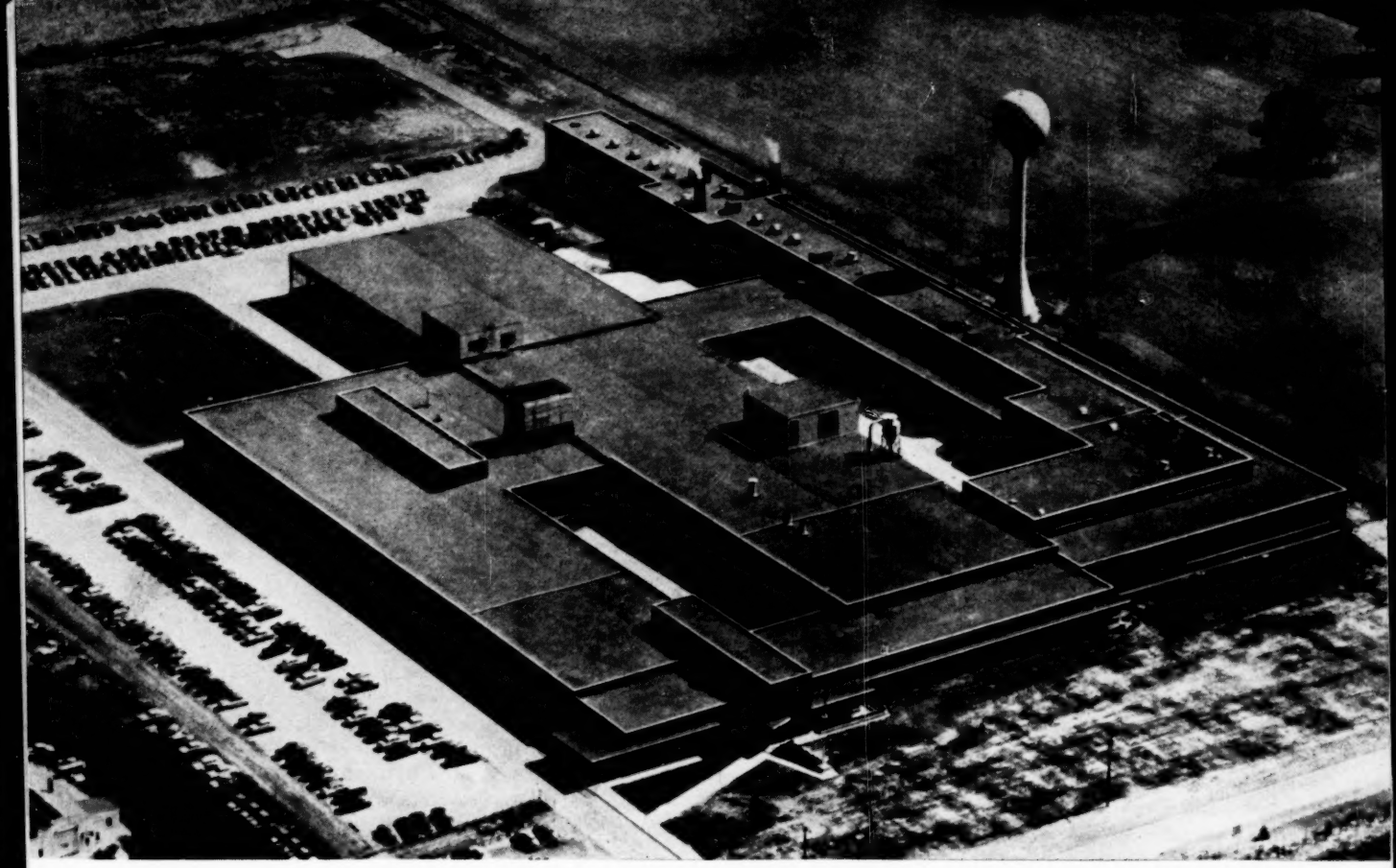
The boiler room is adjacent to the health center area and the air conditioning equipment room is next to the boiler room. This permits the use of a direct expansion air conditioning system with a Freon compressor in the boiler room. The multi-zone air conditioning unit has a direct expansion coil for cooling and a hot water coil for heating. This unit is connected to five separate zones, each zone with its own thermostat operating a fan and bypass damper. Four of the zones were required due to building exposure, and the fifth because of its internal load as it is used as an assembly room.

Heating System

A gas-fired hot water boiler located in the boiler room provides heating for both systems. A hot water pump connected to a hot water coil in the multi-zone air conditioning unit supplies winter heating for the health center area. As the heating coil is in the bypass of the multi-zone unit, the five zone-thermostats work the same way in winter as they do in summer and require no change-over switch. For the laboratory area, the same chilled water pump that serves in summer, circulates hot water through the same lines in winter to the water coils in the units.

Equipment

The laboratory wing is served by a 20 hp compressor while the other wing has a 30 hp compressor. The gas-fired hot water boiler serves both wings.



A research building constructed at Fort Wayne, Ind., is devoted exclusively to research, design, test, and development of motor trucks. The well-regulated systems for air conditioning, heating and ventilating are described. Building designed by Albert Kahn Associated Architects and Engineers in collaboration with the owners' representatives.

A NEW $6,000,000 motor truck engineering and laboratory building, built for the International Harvester Company's Motor Truck Division and situated on 25 acres of ground adjacent to the existing Fort Wayne Works of the Harvester Company at Fort Wayne, Ind., is devoted exclusively to research, design, test and development of motor trucks. It comprises approximately 300,000 sq. ft. of floor space and was designed by Albert Kahn Associated Architects and Engineers in collaboration with the owners' representatives.

Of brick and steel construction, the building is one-story high, has three wings and is E-shaped. The segments of the *E* house the various development areas, including executive offices and drafting operations, road test and experimental shops, engine test cells, transmission and rear axle test cells, and laboratories. Secondary areas containing wide corridors join the segments of the *E* plan of the structure, and these corridors meet the service corridors of the wings forming a service passage to all areas.

Suspended ceilings of mineral acoustic tile or sound absorbing blanket with perforated transite or metal pan acoustic tile were used throughout the building except in the road test and experimental shop areas where roof trusses were exposed.

The administrative wing is comprised of general offices, conference rooms, display room, cafeteria and kitchen, executive dining room and the required toilet and locker rooms. The engineering wing has the drafting room, engineers' offices, reproduction room, file and storage, sales and service, photographic department, and additional toilet and locker room facilities.

Air Conditioning and Ventilating

The air conditioned areas include the administrative wing, engineering wing, medical dispensary in the road test section, offices along the east side of the south court and the structures office on the west side of the building.

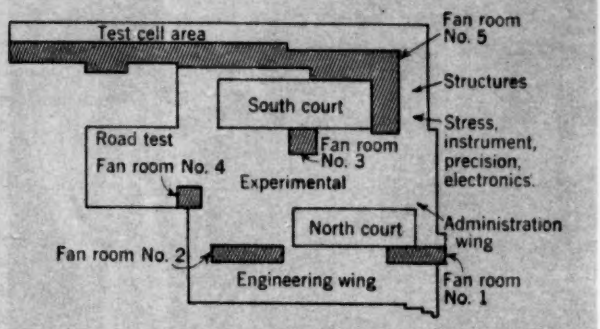
In the test area where the nature of the work, or instrumentation, requires it, air conditioning with temperature and humidity control are provided in such locations as the stress, instrument room, precision measurement, electronics, and carburetor flow laboratory.

The balance of the building is provided with forced ventilation with the rate of air change determined by the use of the area involved. These locations include the road test, experimental shops, test cells, miscellaneous work areas, locker and toilet rooms.

The various departments are served by five main fan rooms located on the roof and above the areas involved as shown on the key plan.

The air conditioning systems, serving offices and other comfort condition areas, are designed to maintain indoor conditions at 80F dry bulb with 50 per cent relative humidity in the summer and comfort ventilation in the

Motor Truck Engineering and Laboratory Building



Key plan showing the location of fan rooms and the various test areas.

winter. These systems provide conditioned air filtered with automatic oil type cleaners and separate zoning for temperature control to the various areas. The systems include direct expansion refrigeration equipment with capacity control. A central cooling tower located above the roof over the reproduction area recirculates water through the condensers. In general, most of the air conditioned rooms are served by ceiling air diffusers with registers for return air. In the ventilated areas, registers for both supply and return serve the various rooms.

The systems, which provide forced ventilation, without cooling, include supply equipment with automatic oil filters and heating coils for tempering the air according to requirements. Recirculating fans return the air for mixing or discharge to atmosphere.

The typical test cells are individually ventilated with supply and exhaust equipment located directly above in fan room No. 5. The equipment provides filtered and tempered air to the cell proper and exhausting is effected through a roof fan unit. Provision is made to recirculate the room air partially or totally according to demand.

Acoustic baffles are installed in the ventilating ductwork to reduce the noise level. Blower type unit heaters in the fan room, serve each cell when heat is required.

The engine exhaust gases from the test cells are handled through underfloor piping to two exhaust fans located centrally in fan rooms on the first floor. The moist hot vapors are discharged through stacks to the atmosphere above the roof.

Filtered and tempered air is supplied to the two portions of the long service corridor below the test cells. They are served by two units in fan room No. 5 with automatic oil filters and tempering coils and by-pass dampers. The exhaust is handled through ductwork and registers along the side and near the floor of the corridor and extending to explosion proof fans which discharge to the atmosphere above the roof.

Three motor generator rooms in the test cell area are ventilated with two-speed supply fans drawing in outside air through capillary air washers and with provision for recirculation. Vane axial fans exhaust the warm air through weatherproof caps on the roof.

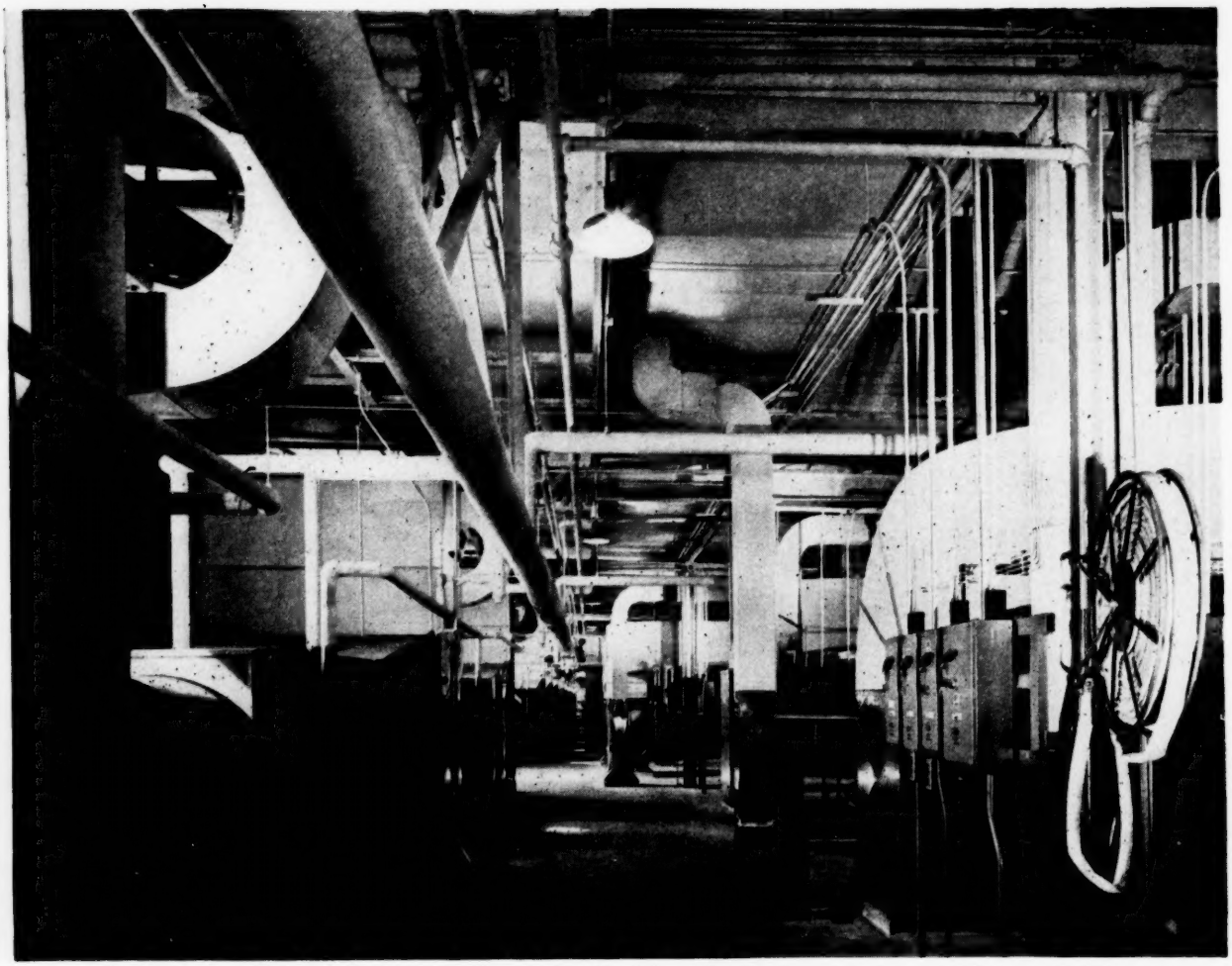
The chassis dynamometer cell and prony brake dynamometer cell are each ventilated with equipment similar to the typical test cells. In addition, separate spark-proof exhaust fans located above draw off the heavy gases in the pit at the dynamometer room floor and discharge to the atmosphere above the roof. The engine exhaust is also handled through spark-proof temperature fans with back draft dampers arranged to maintain constant backpressure at the engine.

The transmission dynamometer and axle dynamometer rooms are ventilated and heated with supply and recirculating units in the fan room above, and are provided with filtered and zoned air.

The carburetor flow laboratory is conditioned with a packaged type air conditioning and ventilating unit including throwaway filters, cooling coil and fan. A heating coil and steam spray humidifier are installed at the fan discharge and a compressor with shell and tube condenser, using city water, is set on the floor. The installation is arranged to give controlled and continuous temperature and humidity readings on calibrated charts in the laboratory.

Air is principally recirculated from the laboratory, and makeup air is taken from the fan room. Purging of air is accomplished with a separate duct from the laboratory return and with automatic dampers to permit discharging to the atmosphere above the roof.

The constant temperature and humidity rooms, namely, stress laboratory, instrument and precision measurement laboratory, and electronics laboratory, are supplied with conditioned and zoned air. Individual recording and controlling instruments for humidity and temperature are installed within the rooms. Multivent supply system with individual valves and duct connections above the acoustic metal ceiling and returns at the floor are ar-



Equipment installed in the main test cell room No. 5 of the motor truck engineering and laboratory building erected in Fort Wayne, Indiana.

ranged to maintain a temperature range of ±2F between the floor and ceiling and humidity conditions of ±5 per cent. The supply and recirculating equipment, for the constant temperature rooms, include automatic oil filters, air washer and direct expansion cooling coils, and separate steam zone heating coils to serve each room. A compressor is used in conjunction with an evaporative condenser for this system.

The total supply, recirculation and exhaust of air in the building is accomplished by 140 fan units with a capacity for handling 2¼ million cubic feet of air a minute. Air changes range from once every 30 seconds in the test cells to once every six minutes in the drafting room.

Heating

The building in general is divided into three different areas as far as the heating system is concerned, namely, the test cell area, which is heated by a hot blast system; the shop and maintenance area, which is heated by a system of forced hot water with steam heated unit heaters at the doors and wash racks; and the office and drafting room section, which is heated by a forced hot water system with convector radiators. These two areas are completely ventilated.

Steam service at 150 lb pressure and the pump discharge line are brought into the building basement from the present boiler, partly on an outdoor trestle, partly through the present buildings, and the final section underground and through the west wall of the building. A connection is taken from this high pressure steam line through a pressure regulating station which reduces the pressure to 30 psi which, in general, is the service pressure for the project.

This 30 lb steam main rises from the basement and runs through the trusses of the shop area to supply the unit heaters and fan rooms in this area through one branch; another branch is run to the south to supply the fan rooms, water heaters, elevated tank and process requirements of the test cell area.

The hot water heating systems for the office section and the shop area are served by equipment located in a fan room which is in the trusses above the shop area. This equipment consists of three water heaters or exchangers supplied with steam at 30 psi. One heater serves the office and drafting room section, one serves the shop area and the third heater serves as a spare which is cross connected to both systems for emergency use. There is a circulating pump with each system and a spare unit for use with either system.

These pumps and heaters serve a system of supply and

return mains which are located in the trusses of the shop area and above the first floor ceiling of the office section. The radiation is of the convector type in the office section, either concealed in built in recesses or in a wall hung cabinet with sloping top grilles. The radiators in the shop area, in general, are of the wall fin type with sheet metal casings and sloping top grilles. The risers serving all the above radiators are down feed from the overhead mains which obviates any necessity for air vents at any place except the ends of the mains.

Each of these hot water heating systems is controlled by an outdoor bulb in conjunction with a bulb in the hot water supply main which operates a three-way valve that either allows the water to pass through the heater or around it according to the heat loss requirements. The water in the heater is maintained at 200F by an immersion type aquastat which controls a modulating valve in the steam line.

The steam heated unit heaters in the shop area, at the doors and in the various storage rooms are all supplied with steam at 30 psi and they are controlled by three-positioned starters and thermostats. Whenever the starters are in the "Auto" position, the thermostat starts and stops the fan as required. When the starter is in the "On" position the fan will run continuously until the starter is placed in the "Off" position. These heaters can be run in the above manner for air movement in the summer with steam turned off. The door heaters have the same starters but also have an additional control in the form of a door switch which starts the heater whenever the door is opened, but the switch does not shut off the heater when the door is closed unless the thermostat is satisfied.

The fan coils of the ventilating system are supplied, in general, with steam from the 30 psi steam grid system through pressure reducing stations in each fan room which reduces the pressure to 5 psi. Each zone coil has its own control valve which is, in general, controlled by a duct stat if the space served has perimeter radiator heating and by a room thermostat whenever the space served has no radiation.

The control system for all parts and sections of the job is of the pneumatic type except the unit heater controls which are of the electric type.

Handling the Condensate

The condensate from all the various pieces of equipment throughout the job runs by gravity through the trusses or through the tunnel under the test cell area to the basement machine room at the west side of the building. At this point all the returns, low pressure, medium pressure and high pressure drips connect to the condensate receiver, and from this point the condensate is pumped back to the boiler house along the same route as the steam service. This pump and receiver unit is of the duplex type consisting of one tank, two pumps, float switches, and an alternator. The alternator operates the pumps alternately and also starts the second pump if the first pump is unable to handle the load or doesn't start.

Main drafting room of laboratory measures 400 x 70 ft and is constructed without columns.

Odor Control Allows Recirculation and Reduces Laboratory Air Requirements

JOSEPH E. LEININGER

Consulting Engineer, New Orleans, Louisiana

Joseph E. Leininger received his B.S. from the College of Engineering of Tulane University and completed two years of graduate study in electrical engineering at MIT. He then did air conditioning engineering for several General Electric distributors and went on to be sales engineer with the New Orleans office of The Trane Company. Mr. Leininger returned to the Trane Co. in 1945 after four years in the industrial chemical business and a term of naval service as an engineering officer. Since 1951, he has been a consulting engineer in mechanical and electrical engineering.

TABLE 1—MEDICAL SCHOOL LABORATORIES—COOLING AIR

Name of Laboratory	Room Volume, Cu Ft	CFM[1]	Air Changes per Hr	Type[2]
Bacteriology and Pathology	34,000	13,250	23.3	1
Clinical Microscope	34,000	5,310	9.4	2
Biological Chemistry	34,000	14,500	23.8	1
Physiology and Pharmacology	27,600	7,200	15.6	1
Gross Anatomy	34,000	3,975	7.0	3
Micro Anatomy	34,000	4,365	7.7	2
Radio-Isotope	11,700	2,190	11.2	3

[1]Cfm based on room sensible internal heat gain with room air at 78F D.B. and supply air at 60F D.B. during cooling season.
[2]Note: Type 1—100% Ventilation Air recommended or some method of purifying recirculated air.
Type 2—Recirculated Air may be used.
Type 3—100% Ventilation Air recommended.

IN approaching the problem of designing an air conditioning system for a laboratory, the design engineer is faced with the handling of large ventilation requirements for maintaining the desired quality of air within the conditioned space. Obviously, if equipment in the laboratory may produce large quantities of obnoxious fumes, it is fundamental that such fumes be confined within one or more fume hoods equipped with exhaust arrangements discharging to the outside at some point where the effect will not be a nuisance to nearby inhabitants and passers-by.

Unfortunately, in certain types of laboratories, and particularly in those which are used for student instruction, the cost of and space requirements for installing the proper number of exhaust hoods is prohibitive. In such cases the usual methods of providing for air purity is to employ a high enough air change rate within the laboratory by introducing a large volume of relatively uncontaminated outside air into the laboratory. This can be done by using a volume blower which may or may not be attached to a ductwork distribution system depending usually upon space requirements and other economic considerations. The degree of success obtained with such a system is often a function of the cleverness and experience of the design engineer.

A typical medical school may have laboratory facilities as follows, outlined in Table 1.

By inspection of Table 1, it may be seen, first, that the amount of air required for cooling may vary widely for a constant room volume; and, second, that the laboratories which require the larger air quantities for cooling may also be those in which recirculation of room air is undesirable unless some method of revitalizing or purifying this air is employed.

Fortunately there are available at this time various types of activated carbon filters which are capable of revitalizing or purifying contaminated air by the adsorption principle. By presenting larger areas of porous surface to the air flowing through the filters, the activated carbon is able to capture and retain various microscopic contaminants which may be present in the air passing through, and moreover are capable of continuing this cleansing effect for relatively long periods of

time before reactivation or replacement of the filter media is indicated. These filters are available in several sizes and types, depending upon the manufacturer as well as the service in which they are employed. To mention two types, these filters have been made up in canister or perforated can type, as well as the pleated or flat filter type. They can be conveniently arranged in racks or banks similar to the conventional type dry or coated air dust filters. In fact, it is good practice in design to employ high efficiency dust filters ahead of or upstream from the activated carbon filters, so that the life expectancy of the latter is not impaired by aire borne dust, and they may perform efficiently the odor removal services for which they have been designed.

In the examples of the medical school laboratories given in Table 1, it has been possible to reduce the design ventilation air quantities in the type 1 spaces, from 100% outside air to 1,300 cfm each, by using activated carbon filters in the return air systems with a resulting savings in the refrigerating plant and the heating plant capacities. The filters used in the bacteriology and pathology laboratory and in the biological chemistry laboratory each consist of two equal banks of eight units, 24 inches high by 24 inches wide by 8¾ inches deep, mounted in banks 4 wide by 2 high, occupying a space 8 ft wide by 4 ft high by 8¾ inches deep. For the other type 1 laboratory, a single bank of the same size units 4 wide by 2 high is used.

Based on a summer design wet bulb temperature of 79F outdoor and 64.3F indoors, the savings in refrigerating plant capacity amount to 138 tons, and based on a winter design dry bulb temperature of 20F outside and 75F inside a savings of 50 boiler horsepower for heating is indicated.

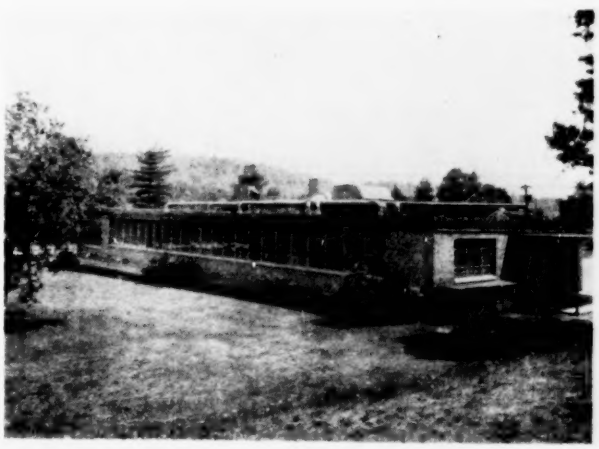
With reference to maintenance of the activated carbon filters, it is estimated that the useful life before reactivation is about 8 months or approximately the length of one school year. A removable test element is provided in each filter bank and these elements are removed and forwarded to the manufacturer every 90 days for inspection and for recommendation on the remaining filter life. A total of 50% spare filter cells have been provided and since all filter cells in all banks are of uniform size, the filters in one or more banks are readily replaceable while the spent cells are returned to the manufacturer for reactivation on an exchange basis. It is important for best operating results that the dust filters ahead of the activated carbon filters be maintained at high efficiency, and for this reason, visual indicators of the air flow through the dust filters have also been provided for routine maintenance checks on these filters.

It is apparent that the maintenance costs on the odor adsorption filters which are estimated at $50.00 per filter cell per school year, or a total of about $2,000.00 for the 40 filters employed is well below the operating cost which the additional refrigerating machinery and heating plant would entail, if the filters were not utilized. In addition, a savings in maintenance and repair costs for this additional plant capacity is also affected.

In the example given in Table 1, the air conditioning units for the laboratories designated as type 2, where the use of recirculated air is permissible without treatment, have also been equipped with provision for the future installation of odor adsorbing filters. If a change in the type of experimentation being conducted in these laboratories should occur it will then be a simple matter to insert this type of filter in the return air duct for these units also.

Chemical Laboratory Takes Care Not To Offend

The Chauncey, N. Y., research laboratory of the Stauffer Chemical Company, in the heart of suburban Westchester County, runs no risk of offending its surrounding residential neighbors, filtering all the exhaust air through activated carbon adsorbers which trap any entrained odors. Organic synthesis in agricultural chemicals and fertilizer process studies comprise the major work of the laboratory; and mercaptans, hydrogen chloride, hydrogen sulphide, sulphur dioxide gases and various other odorous organic vapors are occasionally released, fume problems that are typical of organic and industrial laboratories in general. Air from each of the lab rooms is drawn up to the roof where an auxiliary blower forces it through a bank of fifteen activated carbon cell-type filters before it can reach the atmosphere. Each of the cells has a capacity of 700 cubic feet per minute.



The design and construction of radiochemical laboratories is not vastly different, nor more costly, than that of a standard chemical laboratory; precise handling of a few new factors and greater attention to detail are the major requirements. It is necessary, however, that the designer understand fully the engineering requirements of the laboratory before design is begun. These are: (1) separation of functions, (2) adequate floor space, (3) flexibility of design, (4) proper ventilation, (5) special shielding, (6) ease of maintenance, (7) easily cleaned or removable surface finishes, and (8) a proper liquid, solid and gaseous waste-disposal system.

W. B. HARRIS

U. S. Atomic Energy Commission, New York 23, N. Y.

Laboratories

RADIOISOTOPE laboratories should have more floor space per worker than conventional science laboratories. Estimates vary considerably but appear to center on providing about 50% more floor space area per worker in the laboratory than is customary. The reason for this is the need for a greater separation of personnel, larger storage areas for laboratory equipment and for decontamination purposes. Office functions should be completely separated from laboratory areas except in the case of one or two-room tracer (microcurie) operations. There should be a restriction of eating, drinking, or smoking in the laboratory. In the larger laboratories separate change areas and shower rooms are frequently indicated. Access corridors are recommended for high-level laboratories.

The various levels of radioactive background associated with specific functions will require different emphasis. For example:

(1) Less-than-normal background is needed for special radiation instrumentation and for precise calibration.
(2) Normal background is required in all the normal administrative and service areas.
(3) A low radiation level is that in which tracer work is carried on dealing with microcurie amounts of beta and gamma activity ("cool" work).
(4) Intermediate radiation level accompanies work dealing with approximately millcurie amounts (up to about 500 mc) of beta and gamma radiations.
(5) A high radiation level prevails in areas where approximately curie amounts of beta and gamma emitters are used.
(6) Highest levels of radiation will prevail in the areas used for special developments of the hottest nature, in which multicurie quantities of activity are used.
(7) All degrees of alpha activities need similar treatment but of a somewhat different nature than the above.

The type of radiation—alpha, beta, or gamma—as well as the quantity, must be determined for each functional area in the laboratory, and the attendant hazard established. Certain radioisotopes, when inhaled, ingested, or injected, require more precautions than others. It is of prime importance that the biological hazard be established since design criteria depend largely upon this factor.

Pure alpha and beta emitters can be easily shielded against, but because of their greater ionization potential they may offer serious hazard if they enter the body. Gamma emitters require shielding to intercept radiation, but they are less hazardous than alpha emitters if taken into the body.

In addition to providing biological protection, laboratories must be designed to minimize radiation to which

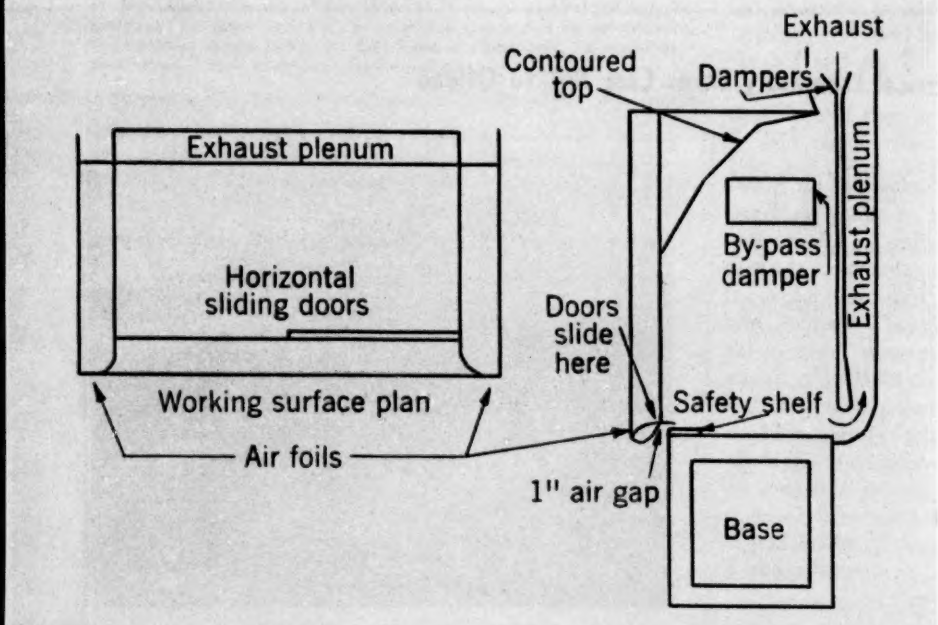


Fig. 1. Composite hood with air foils along side and bottom. Six-foot model would have vertical sash.

for Handling Radioactive Materials

sensitive experimental radiation detection instruments are exposed. These instruments are also sensitive to variations in temperature and humidity and operate optimally in an air conditioned space.

Placement of Facilities

In *low-level* radioactive laboratories, location and site problems are no different from those encountered for standard chemical laboratories.

For *high-level* work, the site selection and orientation of buildings is apt to be of great importance. Meteorology will govern locations of the hotter facilities and their vent stacks, which should be placed downwind from areas of lower activities wherever possible so that contaminated vapors will not be introduced to areas of lower background. Likewise, the ground slope should be kept in mind so that surface waters cannot carry contamination, deposited by foot traffic, from the areas of higher activity down toward functions of lower activity, thus contaminating these areas. Also, the water-table flow should not be permitted to carry any possibly contaminated waste toward the source of any water supply.

In all cases contamination must be localized; potential spread of activity must be reduced by avoiding the placement of hot facilities directly adjacent to cold facilities whenever possible. Hot processing areas should be grouped together to simplify waste handling and to prevent accidental contamination of normally cold areas. It is not desirable to mix units of high and low activity.

Radiation must be held below acceptable levels for instruments as well as personnel, so that, when it is absolutely necessary to place a hot facility directly adjacent to a cold area, shielding may need to be interposed between these areas, even though there is no direct communication. For biological protection the shielding should be calculated to give a total irradiation at the surface of the shield of 6.25 milliroentgens per hour or equivalent. Instrument protection may require a more rigid specification.

Materials of Construction

In considering the properties of materials, new concepts must be accepted by those planning to handle radiochemical work. Normally, four basic properties of materials are considered: (1) resistance to impact and abrasion, (2) ease of fabrication, (3) resistance to weather and corrosion, and (4) appearance. In radiochemical laboratories, certain special properties are given added emphasis: (1) shielding effectiveness, (2) ease of decontamination and/or replacement, and (3) added chemical resistance. It has been found that one or all of these last three factors usually will determine the choice of materials.

In laboratories dealing with microcurie, or tracer, amounts of radioactivity, very little unusual provision must be made beyond that normally used in any chemical facility, with the exception that hoods *must* be available to guarantee the exhaust of airborne particles which may be active.

For intermediate activity laboratories some attention should be given to isolating areas where radioactivity is handled, mainly to provide centralized waste gas and liquid handling facilities. Traffic patterns do not have to be rigidly controlled, although some means for preventing excessive and unnecessary traffic between cold and hot areas should be provided. At this level it will be necessary to introduce at least local shielding, placed around the equipment within the hoods; this can take the form of a lead-brick enclosure for gamma activity. Modular bricks, usually 2 by 4 by 8 inches are available.

Laboratories in which work with high-level activity is carried on frequently need to be surrounded by bulk, or general shielding in addition to local shielding within the hoods. This general shielding may take the form of a 1 or 2-foot thick solid concrete wall. This may be of solid blocks 4 by 8 by 16 inches, laid dry. The use of block is more desirable than a monolithic pour, because of flexibility, as well as for ease of decontamination. High-activity areas must be physically isolated from areas of lower activity.

Special attention to ventilation is needed in areas where alpha operations are located. It is here that glove boxes should be used wherever possible. In laboratories doing work with beta or gamma emitting materials, the matter of greatest import has been that of protection against direct radiation. However, in alpha laboratories considerable danger may lie in contamination of personnel. Alpha rays are not sufficiently penetrating to get through even a sheet of paper. Their danger to personnel is their ability to ionize intensely in their short range. Care must be taken to prevent inhalation or ingestion of this type of radiation. For work with beta and gamma active materials, hoods provided with necessary shielding protect from radiation but the use of glove boxes is desirable in order to confine contamination. This is especially true, however, when dealing with alpha activity. It is important that areas where high activities of alpha materials are handled be localized and restricted to reduce the hazard.

Shielding

Shielding is divided into two general types: bulk and unit. In low level laboratories bulk shielding is usually not

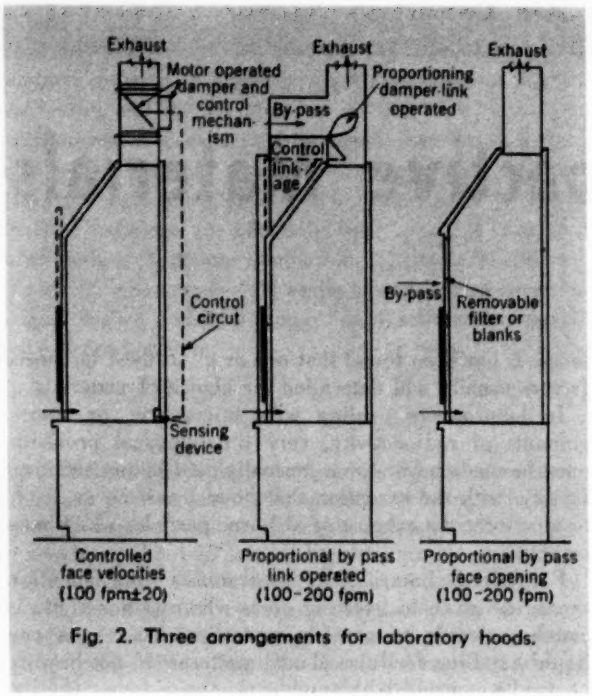


Fig. 2. Three arrangements for laboratory hoods.

provided except for counting rooms, or rooms containing other radiosensitive equipment. For higher level work it may be necessary to provide general room shielding. Unit shielding, usually of the small stacked barricade type, is that commonly used in laboratories.

Generally speaking, the type and intensity of radiation being handled dictates the thickness required. Alpha radiation requires essentially no shielding; beta radiation requires only thin plastic shields, less than 1 inch thick in all cases; but gamma radiation requires more-massive shielding.

Laboratory furniture must therefore be designed to carry the loads of unit shield loads; this is particularly true of hood bases since most radioactive material is handled in hoods; somewhere between 1500 and 2500 pounds of lead may be stacked in an average hood.

Standard bench tops of material similar to Chemstone are normally quite acceptable. Although some operators prefer tops of stainless steel for their work surfaces, this latter material has definitely become a casualty. When a stainless-steel surface must be provided, shallow stainless-steel pans may be used. Where liquids are to be used the bench tops should be provided with a curb about 3 inches high at the rear edge. This type of curb may be used to good advantage, in that it will prevent any material from finding its way down behind the equipment, either during experimental work or afterward when cleaning up. Curbs all around the bench can successfully contain a spill.

Hoods

(1) Operations in which radioactive materials are handled should be enclosed as much as possible to prevent contaminating large air volumes. (The use of glove boxes minimizes air volumes and simplifies air-treatment problems.)

(2) High velocities and cross drafts should be avoided because they may increase contamination and dust loading many fold.

(3) The volume of air withdrawn from the hood must be equal to or greater than the volume of contaminated gases, fumes, or dusts created in the hood.

(4) If possible the operations requiring large amounts of wet digestion and volatilized acid or solvent treatment should be confined to one group of hoods and the handling of dry material in others.

(5) Whenever possible radioactive aerosols should be removed as close to the source as practical to prevent unnecessary contamination of equipment and ductwork.

The application of these conditions will aid materially in reducing the contaminant load on the air or gas cleaner.

Hoods should be of a standard design of 4-, 6-, or 8-foot lengths which may be placed on top of modular base cabinets. Much argument has been presented in favor of stainless steel as a material for hood construction. However, the inevitable use of nitric acid guarantees that corrosion will follow unless some protective coating, of a strippable nature, is applied over the interior surfaces.

The face velocity of air which passes into the hood door opening is the critical aerodynamic design factor. It is generally believed that 150 fpm is essential to guarantee that no vapors from the hood will escape into the room. However, it was found at Oak Ridge National Laboratory, by motion-picture studies of hood performance, that a more careful design of the hood entrance profile can permit the safe use of much lower velocities. As low as 50 fpm has been successful in controlling contamination. This design (Fig. 1) is basically dependent upon the use of airfoil section jambs and sills, with an open slot remaining under the sill. Combined with this, it is necessary to provide a safety shelf approximately 6 inches wide, which drops off 1 inch to the work surface behind it. Streamlining the air flow into the hood reduces turbulence and prevents eddies from carrying contamination out of the ventilated area. The air flow pattern is also much more uniform across the face and permits the use of a considerably reduced air volume through the hood. In addition, a further reduction can be effected when dealing with wide hoods by using sliding doors in such a way that never more than 50% of the actual working face can be opened at one time; this is not too feasible for widths 6 feet or less.

Face velocities of hoods having adjustable fronts which handle radioactive materials should be controlled within reasonable limits in order to reduce the disturbance of airborne material within the hood by high velocity air. Velocity control can be accomplished by either of the following two basic concepts: proportional bypass (constant volume) and controlled face velocity (variable volume) (Fig. 2).

It is fairly well established that face velocities in excess of 200 fpm cannot be tolerated in this type of hood operation, and there are many instances where velocities in the order of 100 fpm are far more desirable. As seen above, when hoods of proper design are available, face velocities of 50 fpm are permissible. This wide range of velocities leaves many types of hoods to be considered. These must be carefully evaluated to ensure selection of the most desirable and economical design.

Wherever high alpha or beta activities are handled, they should be enclosed in glove boxes. These units pre-

sent no ventilation problem in that they are tight, with low flow of air being called for. When materials of high activity are handled, an air volume of between 35 and 50 cfm is usually satisfactory.

Air locks are needed to gain access to these units, or to connect them directly with a hood. These air locks are usually of special design and are dependent on the operation. When the locks open to the room, it is advisable that they be provided with exhaust for being swept clean by air.

Special Equipment and Facilities

In all laboratories handling radioactive materials, it is necessary to provide facilities for monitoring activity levels and for handling personnel meters.

For low-level laboratories, portable monitoring instruments are probably satisfactory. Permanently mounted meters may be desirable, however, and provision should be made for them if possible. Instruments usually used in laboratories are (1) beta-gamma hand and foot counters, (2) alpha hand counters, (3) general background counting-rate meters and alarms, (4) instruments for measuring airborne activity in waste gas streams, and (5) hand rate meter instruments.

In addition, film badges, rings, pocket meters, and similar monitors are usually worn by operating personnel. Space for processing, reading, and storing these personnel monitors must be provided.

Facilities for rapid and complete decontamination of equipment and personnel should be provided. These include lavatories, flooding nozzles, vacuum cleaning equipment and special waste drains piped to sump.

Gaseous, Liquid and Solid Waste Disposal

Waste disposal provisions vary considerably with the type of site and type and level of activity with which the laboratory operators will be concerned.

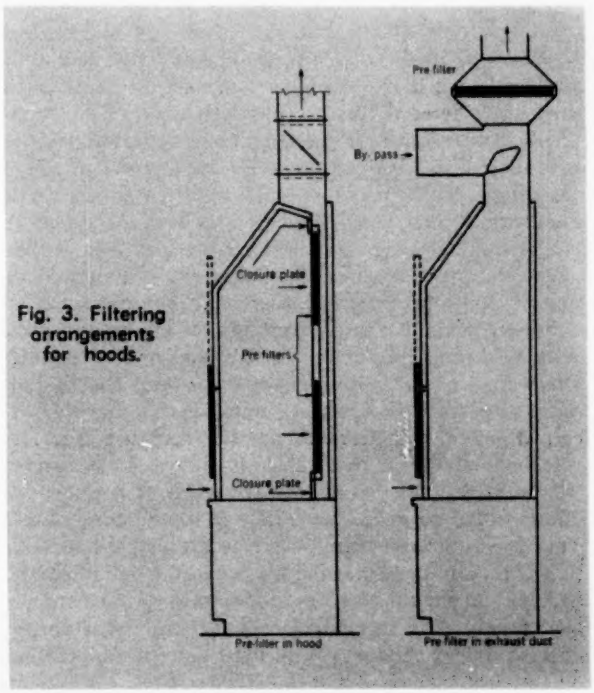


Fig. 3. Filtering arrangements for hoods.

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Mr. Harris received his Ch.E from Rensselaer Polytechnic Institute in 1933 and his M.S. from Harvard University in 1938. He then spent two years in Palestine as a chemical engineer with Palestine Potash Ltd. and as installation manager for Near East Kelvinator. In 1936, he returned to Ohio to be chief engineer for Slagle Chemicals, and the following year began 10 years service as an industrial hygiene engineer for the New York State Department of Labor interrupted by four years in the U. S. Army as an Industrial Hygiene and Safety officer. Mr. Harris began his present affiliation with the U. S. Atomic Energy Commission in 1948.

Air Cleaning: Waste gases from chemical experiments will usually originate from hoods, from which three types of exhaust are possible:

(A) Normal hood air, taken in through the hood door: In low-activity areas, need for filtration of this air is questionable. Where only a few millicuries of activity are handled, filtration is unnecessary. However, in densely populated areas, filters may be desirable even for low activity material to provide "legal insurance", rather than because of actual particulate protection. The discharge can go directly to the atmosphere using standard precautions for laboratory hood exhaust.

General hood air from highest level hoods should be cleaned prior to discharge at roof level. Tall stacks are not required but may be substituted for cleaning where quantities and activity concentrations are sufficiently low.

If a prefilter is installed at the hood, two arrangements are possible (Fig. 3):

(1) Prefilter located at the baffle position at the back of the hood,

(2) Prefilter located in the throat of the exhaust duct. Frequently number (2) is impracticable because of the size of the filter.

Ducts from hoods for low activity levels can be black iron, or galvanized, coated with a suitably corrosion-resistant coating; stainless-steel ducts are not necessary. Hood ducts for even the highest activity work should not become hot in continued use if adequate velocities are maintained, and primary cleaning is used. Exhaust may be manifolded from several hoods, as long as they are all from areas of similar pressure and activity levels. Care must be taken to prevent pressure differences from moving air into one hood and out another when the exhaust is off. It is also important to locate the point of discharge of hood exhaust air remote from any air intake or window.

(B) Equipment ventilation air, or vessel off-gas: Each hood can be provided with a small (½ to ¾ inch) off-gas line, terminating in a standard laboratory, serrated stopcock, through which vent gases from sealed process units can be discharged. For higher levels of work, this line provides a small volume collection system for all corrosive and possibly radioactive gases. If cleaning is required, only a small installation for all hoods in an entire laboratory building is then needed. The off-gas system

can be operated under 10 to 20 inches negative water pressure, with low flows allowed from each hood. The system should be constructed of stainless steel for corrosion resistance. The air mover may be either a steam or water ejector or a moderately high pressure blower, such as for a vacuum cleaner. After cleaning, gases may be discharged to the atmosphere. For tracer and low-level work, this type of system is not required, but it may be found to be a convenient utility under any circumstances.

(C) Laboratory high-vacuum system: Comments on this system, normally supplied in all chemical laboratories, are similar to those for Item 2 except for a higher pressure requirement. The air mover may be a corrosion-resistant vacuum pump. The flow from such a system should be cleaned prior to entering the pump because most vacuum pumps are good air cleaners, and rapidly become contaminated.

Liquids: In a radioactive laboratory there are usually three main liquid-disposal systems.

(1) Normal sanitary sewage system from washrooms and kitchen facilities. Treatment of this is conventional except for hospitals using tracers on patients, where careful analyses must be made of waste material.

(2) The second is process waste, essentially a normal, chemical waste system. In low-level tracer work there will be no need to consider this to be more of a problem then the chemical waste from any normal laboratory. With higher levels of radiochemicals, however, the contaminated process waste may need to be retained in a bottle or tank until analysis of a sample would indicate what manner of disposal should be considered. Drain lines may be of cast iron, or even galvanized, so long as Duriron traps are provided.

(3) The third type of liquid waste is the "hot" drain line which should be of stainless steel. There should be no traps in these lines, because of the build-up of activity which would take place. Therefore all such drains should be located within hoods where they will be adequately vented. Type 347 is preferable, but 304 stainless steel is acceptable. The hot drain lines will generally lead to a hot storage tank, or sump, disposal from which is effected in various ways, depending on the facilities for waste handling that are available.

Solids: Solid materials which become dangerously contaminated with radioactivity must either be decontaminated chemically or mechanically and disposed of in a safe burial ground. Non-combustibles which cannot be decontaminated are usually immersed either at sea or under the ground. Combustibles are usually burned in order to reduce their volume. Laboratory glassware used with radioactive solutions can be washed in a normal manner provided that the waste solutions are sent to the hot drain system and are properly monitored before either collection or disposal.

In dealing with the ultimate disposal of radioactive waste materials, two broad policies have been advocated:

(1) Dilution of the radioactivity of the waste solution below an arbitrary level and its dispersion into a large body of water.

(2) Concentration and confinement of the activity, ultimately disposing of it by burial in waste lands or in the ocean.

Wastes are being concentrated by one or a combination of the following processes: (1) combustion, (2) evaporation, (3) precipitation and filtration, (4) ion exchange.

Level of Radioactivity

One of the basic considerations which must be established initially is the nature of the materials to be handled in the laboratories. This is of great importance since it seriously affects the selection of the type of exhaust system as well as the method of air cleaning, which in turn affects the final cost of the air-handling system. The most desirable solution of this problem lies in the selection of two types of systems: one to handle exhaust associated with low-level (tracer up to 5 mc) and the other to handle higher-level radioactivity. Within this concept a system consisting of hoods and conventional ducts could handle all low-level exhaust, and a system consisting of caves, cells, glove boxes, dry boxes, and hot off-gas lines could handle all higher-level exhaust. This arrangement offers many advantages including:

(1) Reduction of the quantity of air which must be carefully cleaned through elimination of higher levels of activity in hoods.
(2) Better cleaning of smaller quantity of air from hot off-gas system.
(3) Reduction of cost of air handling systems through reduction of air quantities.
(4) Improved health conditions resulting from handling all higher-level material in closed systems.

Air Conditioning

It is desirable that laboratories handling radioactive materials be air-conditioned in order to provide sweat-free conditions. This reduces the hazard of personnel contamination resulting from contact with radioactive materials. Other health benefits include reduction of dust and increase in length of healthful working periods. Still another reason for conditioning is the instrument requirement mentioned previously.

Air Supply

Where high efficiency air cleaning is provided for the hood exhaust, it is very important that the replacement air be prefiltered to remove substantially all of the atmospheric dust. This is not only highly desirable from an operational standpoint, but it also increases the life of the off-gas filters very materially. Dust loadings in the hood exhaust are normally extremely low, and filter life correspondingly long. The high replacement cost of these filters and the difficulties of replacement of contaminated units make precleaning of paramount importance.

Supply air is best introduced into the laboratory at low velocity through perforated ceiling pans or outlet panels. Other types of air-delivery outlets have been used and are quite satisfactory if draft-free requirements are not critical, although it appears to be well accepted that low-velocity delivery is preferable. It should be recognized that in laboratories handling high levels of radioactivity efforts to reduce air currents have in some instances been extended to the convection currents through the substitution of radiant panel heating for convector radiation.

Attention should be given to the problem of emergency power since it is well established that at least a portion of a laboratory exhaust system must be kept in operation.

Ventilation and Air Conditioning for Laboratories

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The type of air conditioning and the amount of ventilation required in a laboratory depend upon the special laboratory equipment used and the variety of tests conducted. This is a general presentation of the subject with recommendations as to the air conditioning and ventilation that may be required in each individual laboratory.

A LABORATORY is a place devoted to experimental study in any science, or to the testing and analysis of materials as drugs, chemicals, or explosives. It may consist of a single room with very limited equipment in a building primarily used for other purposes; a large building with several floors, designed and constructed to provide a number of rooms with special equipment, or some intermediate arrangement between these extremes.

The laboratory may be used for educational purposes: equipped for the most elementary instruction in a small high school; for more advanced work in a college or technical school; for product control of a major industry, or for medical or industrial research.

In any case, it will probably be necessary to provide for ventilating or air conditioning at least a part of the laboratory.

Before ventilation or air conditioning requirements can be properly determined, it is first necessary to become familiar with the general arrangement and purpose for which the laboratory is to be used, the equipment which is to be installed, the time and manner in which the laboratory is to be operated, and the financial limitations of the project.

At the start of the project the engineer should therefore consult with the owners or the architect in charge of the design of the building, the teacher or technician who will be in charge of laboratory operations and the manufacturers of any special equipment requiring ventilation or air conditioning.

Ventilation may be required for one or more of the following reasons:

(1) The removal of noxious odors or deleterious fumes caused by chemical reactions that take place in the laboratory.
(2) The removal of excessive heat transmitted from outside to the laboratory or generated within the area by mechanical or electrical equipment, chemical reactions, or the occupants of the laboratory.
(3) The removal of dust in air entering the laboratory or created inside the room, which may adversely affect the work being carried on in the laboratory, or which may be harmful to the occupants.
(4) The elimination of odors in the space occupied by animals used in the laboratory.
(5) The removal of radioactive particles from the air.
(6) To supply sufficient fresh air for occupants of small interior rooms such as dark rooms.

Air conditioning may be necessary for any of the following reasons:

(1) To control the rate of chemical or biochemical reactions.
(2) To control the rate of crystallization.
(3) To provide standard conditions for obtaining uniform test data.
(4) To limit variations in physical measurements or physical characteristics of materials or equipment tested or used in the laboratory.
(5) Maintenance of low dew points to prevent condensation of moisture from the air which might cause corrosion on metal surfaces or otherwise affect the accuracy of work carried on in the laboratory.
(6) Maintenance of suitable conditions for the culture or growth of bacteria or healthful conditions for animals or insects used in the laboratory.
(7) Maintenance of comfortable working conditions for the occupants of the laboratory.
(8) To provide widely varying conditions of temperature to observe the affects of such changes on human beings, materials or equipment.

LABORATORIES FOR EDUCATIONAL BUILDINGS

High Schools—Laboratories for high schools generally consist of a few rooms which are equipped only for elementary instruction in physics, chemistry and dietetics.

The general ventilation for these rooms should be in accordance with the state code or municipal requirements, and if funds are available, one or two hoods with natural or mechanical ventilation may be installed in the chemistry laboratory for the removal of objectionable odors or fumes.

Colleges, Technical or Medical Schools—Laboratories for colleges, technical or medical schools may be housed in a single separate building or several buildings and commonly will have at least one lecture room capable of seating large classes of students, several small lecture and demonstration rooms, a library and other rooms specially equipped for laboratory instruction.

Many of these rooms require special ventilation and for some the advantages of air conditioning are so great that it should be given serious consideration when planning a new laboratory building.

Large Lecture Room—A large lecture room in a laboratory building may be of sufficient size to seat from 200 to 500 students. Such a room will probably not only be used intermittently during the regular school periods, but may also be used for other large gatherings after regular hours or during the summer months.

For demonstrations of chemical reactions a special table equipped with the common laboratory services and a downdraft hood may be wheeled into the lecture room from a nearby preparation room. If the preparation room is located adjacent to the front of the lecture room, a hood may be built into the wall between the two rooms but in either case a separate exhaust fan and system of duct work should be provided.

If projection equipment is to be used, provision should also be made for its ventilation.

Large volumes of air must be handled to meet even the minimum ventilation code requirements and it will be advisable to provide supply and exhaust ventilation systems which may be operated independently of the ventilation systems for other parts of the building.

If the funds available for the construction and equipment of the laboratory will permit, air conditioning of such a room is desirable. This will not only benefit the occasional occupants during the warm weather but will also help to prevent drowsiness and inattention to the lecturer during normal classroom periods. A temperature of 85F and 50 per cent relative humidity should be satisfactory with 95F outside temperature.

A quiet distribution system is essential for either a ventilation or air conditioning system, and air velocities should be kept low to prevent noise.

Library—A library is not only a place for quiet reading and study but also a place for storage of valuable books and documents. It is, therefore, desirable to eliminate dust which is harmful to paper and bindings, and to maintain suitable temperatures and humidities to prevent the paper from becoming brittle due to the air being too dry, or blotched due to dampness, and to increase the useful life of the bookbinding material.

Recommended conditions to be maintained are 80F during hot weather and 70F during cold weather, with relative humidities from 40 to 50 per cent.

Small Lecture and Demonstration Rooms—These rooms should have general ventilation in accordance with state or local requirements, and exhaust ventilation from a downdraft hood on the lecture table or through a regular hood as in the large lecture room.

General Chemistry Laboratory—This laboratory which is used for elementary instruction in general chemistry is frequently equipped with individual downdraft table type hoods at each working space to enable students to do all their work at their assigned locations. Duct work for these hoods should be installed below the table tops at the back of drawer or cabinet space.

One or two large hoods may be provided for special experiments.

Analytical Chemistry Laboratory—This laboratory will probably be used by large groups of students. Individual downdraft table type hoods similar to those in the general chemistry laboratory may be used, or a few large hoods may be provided. If large hoods are used, then about 4 ft length of hood for every 10 students will be required.

Organic Chemistry Laboratory—A laboratory for elementary work in organic chemistry will require one open front hood for every four to eight students.

As experiments which release hydrogen chloride gas are frequently made on an open table, it is essential that good general room ventilation be provided, and that there are no dead spots where fumes may collect.

J. E. York, at present Building Service Engineer for Stone & Webster Engineering Corp., Boston, Mass., has had extensive experience as an engineer, teacher and writer, and is the author of the book, Methods of Joining Pipe. He has had an important part in the design of heating, ventilating, air conditioning, refrigeration and piping systems for a number of major industrial plants and laboratories and he has made an extensive study of laboratory needs.

Laboratories for preparations and for research work should have one hood for each two students and these hoods should be equipped with their own exhaust fans.

Rooms in which combustion furnaces for analytical organic laboratories are located should be well ventilated.

Microanalytical laboratories for organic work require a room in which a hood is provided and a separate balance room, both of which should be air conditioned to 75F and 50 per cent relative humidity. The hood in the laboratory should be of the closed type and should take its air supply from outside this room.

Biological Laboratory—In addition to the laboratory which is equipped with chemical exhaust hoods, rooms may be required for housing animals, insects, plants or bacteria cultures.

Air conditioning is desirable in the laboratory and these auxiliary rooms. Hoods should be of the closed type, which take their air supply from outside the air conditioned area.

Animal housing rooms should be kept at about 78F and 50 per cent relative humidity. Odors in these areas may be controlled by circulating the air through a bed of activated carbon.

Year-round air conditioning should be provided in rooms for keeping and feeding rats, as this appreciably reduces the mortality rate.

Rearing rooms for houseflies and roaches should be maintained at about 50 per cent relative humidity.

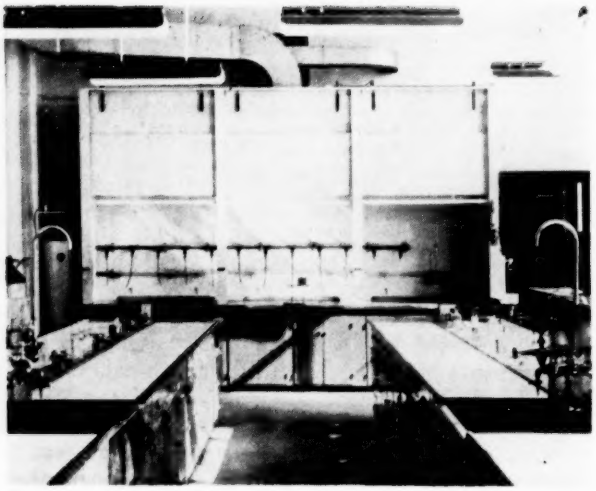
For the study of microbiology, small dustproof rooms are required, in which low air velocities should be maintained.

Biochemical Laboratory—This laboratory which is used for experiments dealing with chemical compounds and processes occurring in organisms (plants and animals), commonly is of sufficient size for classes of 100 or more students. One lineal foot of hood space per student is desirable and consequently large quantities of air must be exhausted from this laboratory.

Balance Rooms—Air that is free from dust or corrosive fumes should be supplied at low velocities to a balance room to prevent disturbing the balances. Ceiling diffuser-type inlets are sometimes used for this same purpose.

If a balance room opens directly off a laboratory, fresh air may be supplied through it to the laboratory to prevent any possibility of corrosive fumes entering the balance room and damaging the balances.

A small room for slow evaporation and concentration of solutions is sometimes provided and should have exhaust ventilation. Glass blowing rooms should also be well ventilated. A cold room in which there is a closed hood is sometimes located near the organic laboratory and should be air conditioned to about 40F.



Hood with plenum chamber exhausted into duct, with exhauster in roof. All photographs, courtesy A. B. Stanley Company, Inc., Boston, Mass.

Physical and Electrochemical Laboratory—In addition to the laboratory proper, which should be equipped with a large hood, there may be an optical room, a balance room and a dark room for elementary work; for advanced or research work, a cold room, a dust-free room, a mass spectrograph room and constant temperature rooms.

Clean dry air should be supplied to the optical room; exhaust ventilation should be provided for the hood; and air conditioning for the spectrograph room, dust-free room and constant temperature rooms.

Chemical Engineering Laboratory—A distillation column is commonly provided in this laboratory, and will generally be of greater height than a normal two-story structure. It will, therefore, be necessary to provide a small penthouse on the roof to house the upper part of the column, or to provide a pit for the lower part of the column.

Any leaks will release vapors that, because of their density, may tend to collect in low spots. If a pit is provided, an exhaust fan should be installed near the bottom to remove these vapors. The fan should be of sparkproof construction, with an explosion proof motor and should discharge the gases to a safe location.

If a crushing and grinding room is provided, it should have exhaust ventilation for the removal of dust.

Furnaces, except small laboratory models, should be housed in a special room with adequate ventilation for removal of excessive heat.

Metallographic Laboratory—This laboratory is used for the microscopic study of metal structures and alloys and should preferably be divided into the following rooms:

(1) The laboratory in which microscopes, furnaces, etching equipment and a fume hood are located.
(2) A shop and rough grinding room for rough preparation of samples.
(3) A polishing room for finished work on samples.
(4) A photomicrographic room and a dark room.

Air conditioning is desirable for all parts of this laboratory except the shop and rough grinding room, which should be well ventilated for dust removal.

Physics, Physical and Electrical Measurements Laboratories—These laboratories ordinarily do not require any special ventilation, but where primary gages are stored and used, both temperature and humidity should be maintained within close limits to insure gage accuracy. Temperatures commonly maintained are between 75 and 80F with ± 1F tolerance and relative humidities between 40 and 50 per cent to prevent destructive condensation on gage surfaces. Relative humidities should be maintained within ± 5 per cent of the desired degree.

Air supplied to these conditioned rooms should be free from dust and both impingement and electrostatic filters may be required to obtain the desired degree of cleanliness.

LABORATORIES FOR INDUSTRY

Many large industries have found it necessary to build laboratories for control of operations in their plants or for research in the development of new products or better ways for the manufacture of existing products.

A few of these are listed in alphabetical order in accordance with the type of industry or service for which they were built.

Alkali Products Laboratory—A number of small analytical laboratories equipped for alkali research are equipped with hoods, each of which is ventilated by its individual exhaust fan located in a penthouse.

Purifying equipment is provided to remove noxious odors and fumes from the air before it is released to the atmosphere.

Air is supplied to the building through electrostatic filters and tempering coils in sufficient quantity to maintain a slight positive pressure on the building and thus prevent infiltration of dust-laden air.

Cement Laboratory—A laboratory for the control of the quality of the finished product of the plant and for making physical and chemical tests of raw materials used in the product has physical and chemical laboratories equipped with hoods and a special room for sample grinding and preparation. The entire laboratory is air conditioned in summer and winter.

Chemical Plant Laboratory—The analytical control laboratory for a modern chemical plant is equipped with a large number of hoods each of which is provided with a cast iron exhaust fan of 1,000 cfm capacity.

Face velocities from 25 to 40 fpm are generally used through open hoods in this laboratory, but in special cases velocities up to 100 fpm are used. The total volume of air exhausted equals approximately six changes per hour. Exhaust ducts are of acid resistant metal. Filtered and tempered air is supplied to the building.

A microanalytical laboratory, which contains a fume hood, and a balance room are independently air conditioned to approximately 77F and 55 per cent relative humidity.

Dust-free air is supplied to the balance room through air diffusers to reduce air currents to a minimum.

Distilling Laboratory—A laboratory for quality control of the products of a distillery makes determinations of refractive index, pH, esters, acids and aldehydes. No fume hoods are required and mechanical ventilation is provided for the entire laboratory.

Food Products Laboratory—A laboratory for the quality control of flour and cereal food products is also

equipped to make chemical and physical tests on raw materials used in the products.

Laboratory equipment includes a spectrophotometer and a photoelectrometer. Mechanical ventilation is provided for the entire laboratory.

Forest Products Laboratory—This laboratory is used to determine changes in weight, dimensions, and physical properties of wood, paper, textiles and cereals and to study the growth of small organisms, plants, animals and insects under varying conditions of temperature and relative humidity. It is air conditioned throughout.

Adsorption equipment is used for removal of moisture from the air where very low relative humidities are necessary.

Glass Laboratory—In a laboratory which is used for the quality control of glassware and the raw materials used for its manufacture, the tests which are made are mainly of a physical nature but fume hoods are provided for making chemical analysis. All heating operations are performed in hoods to carry off excess heat. Mechanical ventilation is provided for the entire laboratory.

Metals Laboratory—A laboratory for the determination of physical properties of metals is equipped with melting furnaces, heat treating furnaces and quenching bath. The rooms in which these are housed are provided with exhaust ventilation for removal of heat and fumes.

Another laboratory for the analysis of brasses, bronzes, lead, solders and flux is equipped with fume hoods, a perchloric acid hood and a hydrogen sulfide hood. Mechanical ventilation is provided for this laboratory.

A room with apparatus used for determination of other metallic elements in aluminum alloys has a large fume hood for making chemical tests.

A microscope room is supplied with filtered air which is exhausted through an adjacent sample preparation room to prevent dust from this room entering the microscope room.

Separate space is provided for spectrographic equipment and this space is air conditioned to maintain a temperature of 75F and 40 per cent relative humidity all the year-round.

Paper Laboratory—A laboratory for testing paper is kept at 75F and 50 per cent relative humidity.

Petroleum Refinery Laboratory—A laboratory for making flash, fire, pour points, gravity tests and chemical determinations of the products of a petroleum refinery is equipped with fume hoods and an infrared spectrophotometer, and is air conditioned throughout.

One refinery provides mechanical ventilation for its laboratory in which are made tests of octane ratings, vapor pressure, viscosity, pour and flash point.

Pharmaceutical Laboratory—A laboratory used for the quality control of a wide variety of finished pharmaceutical products and for tests and analysis of various drugs and chemicals entering into their manufacture is liberally equipped with fume hoods. It is provided with mechanical ventilation.

Infrared spectrographic and emission spectrographic rooms and small laboratories for the control of some of the finished products are supplied with conditioned air for control of temperature and humidity and for protection against dust and air-borne bacteria.

Physical Measurements Laboratory—Large amounts of power are used by equipment for making tensile, compression and impact tests. The equipment is therefore so arranged that the space where the operators have to work is partitioned off from the equipment and is air conditioned.

Laboratory installation of hood with exhauster.

Electron microscopes and electronic diffraction equipment generate considerable heat and require dust free air. The laboratory in which this equipment is located is therefore air conditioned to maintain temperatures around 75F with 50 per cent relative humidity. An electrostatic filter is used to remove dust from the air.

Special precautions are taken to prevent the transmission of vibration from the air conditioning system to the electron microscope as vibration would seriously interfere with the operation of the equipment.

Spectrometer equipment in the mass spectrographic laboratory releases approximately 4 kva as heat. Since temperatures over 90F reduce the operating efficiency of this equipment, the laboratory is air conditioned. Air conditioning is also required for the laboratory in which X-ray and spectrographic equipment are used.

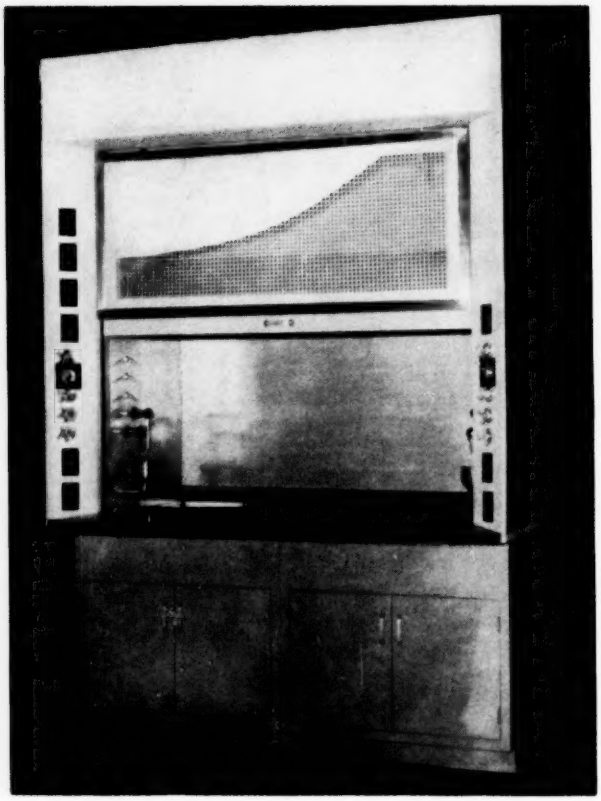
Dust-free air is required for the emission spectrographic laboratory. Electrostatic filters are used for cleaning the air; air conditioning is provided to maintain a temperature of about 75F and 50 per cent relative humidity. The laboratory equipment releases the heat equivalent of 5 kv.

Hoods are provided over the arcs for removal of dust and fumes.

The infrared spectroscopy room is air conditioned to maintain a temperature of 76F and a relative humidity of 35 $\pm$ 2 per cent.

In order to prevent destructive condensation on gage surfaces, the electrical measurements and instrument calibration laboratories are air conditioned to maintain 25 per cent relative humidity.

Plastics and Rubber Testing Laboratory—This lab-



Opening covered by grille of radioisotope hood in front of plenum chamber allows proportioned amount of air to enter plenum chamber directly from room as sash is lowered.

oratory is air conditioned to maintain standard conditions of 77F ± 2F and 50 ± 2 per cent relative humidity.

Rubber Laboratory—A laboratory for control of finished polyvinyl materials and the raw materials used in the plant has several fume hoods. It is provided with mechanical ventilation.

SCIENTIFIC AND MEDICAL RESEARCH LABORATORIES

Laboratory Using Radioisotopes—Special radiochemical hoods are used in the laboratory with air velocities of 100 fpm across the face of hoods as required by the Atomic Energy Commission regulations. Each hood has its own independent exhaust system; fans and duct work are of stainless steel except where HC fumes are present in appreciable quantities.

Air leaving these hoods is passed through filters for removal of small particles of radioactive material before it is discharged to the atmosphere. The filters are located as near the hoods as possible to reduce the amount of surface exposed to contamination.

Counting rooms in the laboratory are air conditioned to maintain temperatures of 75F ± 2F and relative humidities of 45 ± 5 per cent.

Laboratory for Study of Infectious Diseases—All of the air exhausted through hoods used in the study of virus infections is passed through a hot gas flame or electric grids before it is released to the atmosphere.

Red Cross Laboratory—Sealed rooms provide sterile conditions for handling blood during processing. These rooms are air conditioned to provide accurate temperature control, which is necessary during the processing.

Environment Laboratory—During recent years much research work has been carried on to determine the effects of environment, especially with regard to climatic conditions on human beings. Special rooms have been provided for this purpose in a hospital. Bedrooms used for continuous long-term tests may be maintained at widely varying temperatures and relative humidities with permissible temperature variations of less than 1F and relative humidity variations of less than 4 per cent.

Rooms used for short-term studies having to do with exposures to rapid changes in temperature and humidity have the same permissible deviation limits but the temperature and relative humidity ranges are much less.

Other rooms are air conditioned for normal comfort conditions, including rooms which are provided with electro-encephalographic equipment for diagnosis of mental conditions.

Determining Ventilation or Air Conditioning Requirements

From the preceding brief descriptions of educational, industrial, medical and scientific research laboratories it is apparent that in the majority of laboratories where chemical reactions occur, the ventilation requirements are based on the number and size of hoods in the laboratory and the velocity of the air at the entrance to the hoods.

In laboratories where no noxious odors or hazardous fumes are released, the amount of excess heat to be removed and the permissible temperature rise of ventilation air passing through the laboratory may determine the ventilation requirements.

Where it is necessary to provide air conditioning because of special equipment used, or processes carried on in the laboratory, complete information regarding the requirements should be obtained from the manufacturers of the equipment, or experienced technicians familiar with the operation of similar laboratories.

Fume Removal

Hoods for removal of fumes may be of a type which do not have any front sash, or the hoods may be provided with sash which is partially or completely closed during operation. In the last case some auxiliary source for supplying air to the hood must be provided.

In general, the following velocities across the face of the hood with a full front opening are considered advisable:

50 to 60 fpm for high schools
60 to 80 fpm for colleges and hospitals.
80 to 100 fpm for industrial laboratories.
100 to 150 fpm for radioactive and virus laboratories.

Downdraft table type hoods should have a capacity of about 150 cfm.

Heat Removal

Where hoods are not required and it is necessary to provide ventilation for removal of excess heat from the laboratory, the quantity of heat to be removed must be determined.

Heat released from lights, other electrical equipment and by the occupants of the laboratory can generally be determined with a fair degree of accuracy.

The heat released by a motor, to the laboratory in

which it is located, will depend not only on the horsepower of the motor but the percentage of work done by the motor used within the laboratory.

The heat release from furnaces, ovens and other equipment should be obtained, where possible, from the manufacturers.

The heat generated by bunsen burners or other gas-burning equipment can be closely approximated from the product of the total gas consumption and the calorific value of the gas.

The heat release from hot pipe lines can be determined from the product of the length of pipe, the heat transmission coefficient per lineal foot of insulated or bare pipe, whichever is used, and the temperature difference between the inside of the pipe and the room.

The volume of air supplied for ventilation must be sufficient for removal of the total computed heat gain without exceeding the permissible temperature rise in its passage through the room.

Ventilation for Balance Rooms and Dark Rooms

Ventilation provided for balance rooms and dark rooms, when the removal of fumes, odors or excess heat is not necessary, is generally based on arbitrary allowances of four or more air changes per hour in accordance with the judgment of the engineer. Small rooms which will not affect the total ventilation requirements to any extent may have as many as 12 air changes per hour. The quantity supplied to balance rooms must not be sufficient to cause drafts which will affect the balances.

Air Flow

In order to reduce to a minimum the possibility of any flow of air from rooms where fumes, odors or excess heat are generated to other parts of the building, such rooms should be maintained under negative pressure while in use, and other rooms should be kept under a positive pressure.

When laying out supply and exhaust systems of duct work, care should be used to prevent any possibility of flow of air from contaminated to uncontaminated rooms when any part of the ventilation system is not in operation. Inlet grilles should be located to provide maximum travel across the laboratory with best distribution before the air reaches the hoods or other exhaust outlets.

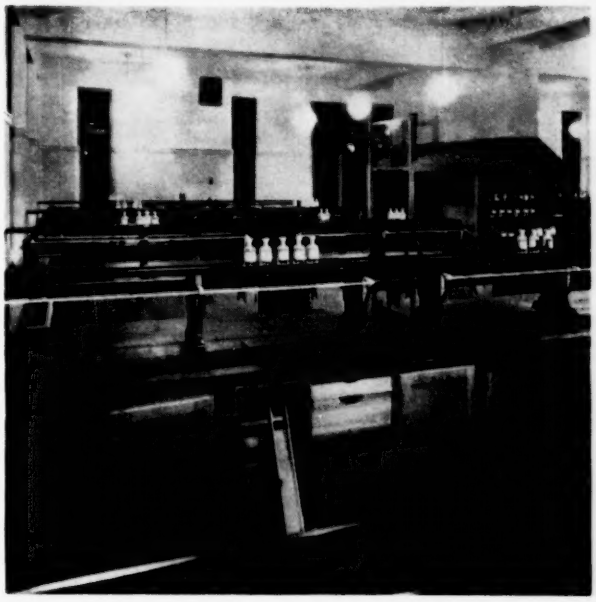
Drafts, which may affect the operation of bunsen burners, should be avoided and balance rooms should be supplied through diffuser type inlets.

Hood Exhaust Systems

There are several types of fume hoods available for use in ventilated or air conditioned laboratories but in general the air will be exhausted from an outlet in the top which may be connected to a common exhaust system or to individual exhaust fans or gravity exhaust stacks. Gravity stacks are not very satisfactory and now are rarely used.

Hoods for Kjeldahl digestion and distillation should each have a separate exhaust fan and duct constructed of high silicon iron. Exhaust ducts of stoneware or lead are sometimes used for these hoods.

Hoods equipped with water or steam baths must handle an excessive amount of moisture and provision should be made for draining condensation from the duct work.



Hoods in center of a laboratory around stacks to exhausters in attic.

Perchloric acid reactions generate perchlorates that are easily detonated in the presence of organic matter. Materials used for the construction of perchloric hoods should be inert, non-absorbent and free of any organic impregnation. Separate cast iron fans and corrosion resisting welded metal vertical exhaust stacks should be provided for each hood. Water spray nozzles should be installed at the top of the duct and at bends for cleaning. Provision should be made for draining the wash water from the fan and duct work.

Etching hoods should have separate exhaust fans and ducts to insure control of the fan operation until the acid bath has cooled sufficiently to stop fuming. Horizontal ducts should be sloped to suitable drain connections.

The exhaust from virus hoods should pass through a hot flame or electric grid before it is discharged to the air.

Canopy hoods over sinks for the disposal of fuming liquids, steam tables, etching tanks and grinding operations should be larger than the area of the working surface below, and while it is desirable to keep hoods as low as possible, proper head room for equipment and for access must be provided. As these canopy hoods are frequently open on all sides, cross drafts will carry the fumes and vapors outside the area of the canopy unless high inlet velocities at the hoods are maintained. The use of double hoods with a narrow slot around the periphery makes it possible to maintain high velocities around the perimeter of the hood without exhausting excessive quantities of air.

Where fumes or vapors are released at low points, it is sometimes possible to provide exhaust ducts with horizontal slots near the point where the fumes or vapors are released. Air entering the slots at high velocities will draw in the fumes and vapors.

Small hoods for mounting on the tables and provided with downdraft connections are sometimes installed. The hoods are relatively cheap, do not take up much space or obstruct the vision and, as a number of these hoods may be installed, good general ventilation can be obtained

by their use. Equipment creating fumes can generally be used where the fumes can be picked up by one of these hoods. The duct work must be small and fans must be able to handle the air volume against high resistances.

Individual or Central Exhaust Systems

Individual exhaust systems offer these advantages:

(1) A hood with a separate exhaust fan may be used if necessary when the full laboratory is not in use.
(2) The operation of the fan may be controlled to suit the work being carried on in the hood.
(3) Fans and duct work which must be built of expensive materials to resist the corrosive effect of fumes may be kept small thus reducing the cost.
(4) The possibility of leakage of noxious or hazardous fumes between rooms through duct work is reduced.
(5) Small vertical discharge ducts from individual fans may be concealed in furred spaces and carried up through the roof.

A central exhaust system has the following advantages:

(1) Fans and motors may be easily serviced.
(2) None of the duct work conveying noxious or hazardous fumes will be under a positive pressure, thus reducing the possibility of leakage of fumes.
(3) There is less hazard that a room which is supposed to be operating under a negative pressure will actually be operating under a positive pressure due to the exhaust fans being shut down.

Supply Systems

Air to be supplied to the building should be taken from a cool, clean and dry location. Generally, a fresh air supply equipment room located on the roof of the laboratory will best meet these requirements. For architectural reasons, or because of the possibility that vibration or noise may be transmitted to laboratory space on the floor below, it may be necessary to locate the fresh air supply equipment on the ground floor. If the fresh air intake is so located that the entering air will not pick up dirt or dust, this may have the following advantages:

(1) Heavy and bulky equipment will not have to be hoisted up to the roof of the building.
(2) Heavy roof or penthouse construction will not be required to support the equipment.
(3) The system will be in a more convenient location for inspection and servicing.
(4) The hazard of damage to rooms and equipment below in case of leaks from equipment or piping will be eliminated.
(5) Noise and vibration due to operation of the ventilating equipment will be reduced or eliminated.

Duct Work for Central Systems

Duct work for supply and exhaust systems will occupy considerable space in a laboratory building and will also cost an appreciable amount of money. Careful consideration should be given to these systems before the arrangement of rooms and the structural features of the building are fixed. For a laboratory which is spread out over a large area, it will probably be advantageous to provide more than one supply system and if individual exhausts are not used to provide several group exhaust systems.

The relative advantages of horizontal and vertical distribution systems must be considered for the particular installation.

With horizontal distribution one or more supply systems may be located on the ground floor with fan discharge ducts run vertically through suitably located enclosed duct and pipe shafts. These vertical ducts supply horizontal distribution ducts located at the ceilings of the corridors on each floor, with short branch connections to supply grilles in the corridor walls of each laboratory or other space requiring ventilation.

With vertical distribution, the horizontal duct work will be confined to the ceiling of the ground floor which may be higher than for other floors. Vertical supply ducts to serve individual laboratories on each floor may be concealed in furred spaces or between double walls on the corridor side of the rooms.

With horizontal distribution, exhaust ducts may be run along the corridor ceilings adjacent to the supply ducts. Both ducts may be installed close to the ceiling and so arranged that as the one duct decreases in width the other increases. The bottoms of the ducts should preferably be kept at the same height for the entire run and space should be provided between the bottoms of these ducts and supply piping in the corridor to permit installation of branch connections from each duct to rooms on both sides of the corridor.

Shafts for vertical exhaust ducts should be provided at suitable intervals to connect to exhaust fans on the roof.

If vertical distribution is to be used, individual exhaust fans may be provided which may be located adjacent to the hoods they serve or individual roof type fans may be installed. With fans located adjacent to the hoods, smaller ducts may be used but there will be more chance for leakage of fumes as these ducts will be under pressure.

Air Conditioning

If the laboratory as a whole is to be air conditioned, a central supply system located on the ground floor adjacent to the room containing the refrigeration equipment will save the cost of long insulated refrigeration lines and will also simplify the supervision and maintenance of the system.

If temperatures and humidity control requirements for limited areas are more rigid than for the laboratory in general, it may be necessary to install additional cooling and dehumidifying coils in the air supplies to such rooms or to install individual cooling units in these rooms.

Where only a few rooms in the laboratory require air conditioning, these rooms should, if possible, be grouped together and space provided nearby for refrigerating equipment to serve them.

If very low humidities are required in laboratories or constant temperature rooms without correspondingly low temperatures, an air conditioning system combining chemical dehumidification with mechanical refrigeration may be used.

Recirculation of Conditioned Air

Air from laboratories where odors, fumes or excessive heat are released or which are used for the study of infectious diseases or radioactive materials, should not be recirculated. However, the size and cost of the air conditioning equipment may be reduced by arranging for the recirculation of air from laboratories and offices in which these objectionable conditions do not occur.

The Right Size for Relief Valves and Low Water Cut-Offs

T. W. REYNOLDS

IN an article by the writer on "Low Boiler Water Temperatures Cause Flue Condensation," in the July, 1953 issue of H & V, there are the following two closing paragraphs:

"In many installations a single relief valve may be of proper size for adequate relief, yet become a source of considerable damage due to over-relief from over-size. Quite often, on a single boiler there should be two or three relief valves installed in steps as to pressure and relieving capacity, particularly so with boilers of small water content.

"A roof installation of a boiler is quite apt to be gas-fired. One such installation with a 2,000,000 Btu input and only 100-gallon water capacity, had a single 2-inch relief valve. When the expansion tank became water-logged, the system built up a pressure sufficient to open the relief valve with a bang, thus suddenly relieving nearly all the boiler water over the boiler room floor. The velocity of escaping water was sufficient to hold the float of the low water cut-off in the closed position. This boiler installation cost $300 to replace. In an assembly of three step-type relief valves, the relief valve of lowest setting (30 lb) would have relieved the immediate pressure in this installation."

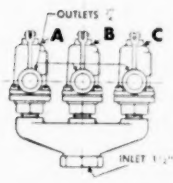


Fig. 1. Staggered settings for relief valve: A = 30 lb; B = 33 lb; C = 36 lb.

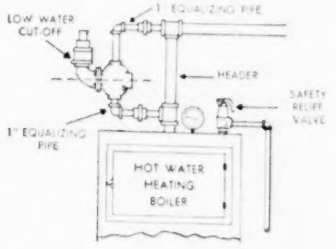


Fig. 2. Low water cut-off installation

A correspondent who commented on these statements agrees that staggered settings are advisable, Fig. 1, for pressure relief valves on hot water heating boilers, but he cannot understand how the low water cut-off could remain in a closed position if installed as shown in Fig. 2. Advised of location of the boiler in question, he investigated and reports as follows:

"Connecting pipes were so muddy that it is doubtful whether the low water cut-off could have functioned, regardless of any action caused by velocity of escaping water through the pressure relief valve. Furthermore, the low water cut-off of the insertion type, has a rated pressure rating of 15 psi and we must assume that the hot water heating boiler complies with the ASME Boiler Code which code permits a relief valve with a set opening pressure of 30 psi to be installed on the 30 psi allowable working pressure boiler. With this in mind, it is questionable whether a low water cut-off with a rated working pressure of 15 psi should have been installed on this boiler, for should the pressure reach the opening point of the relief valve, it is obvious that the control might have failed to function because of an over-pressure condition.

A built-in type of low water cut-off can be obtained which is (1) self cleansing, and (2) which has proven satisfactory for many years on steam boilers. However, it is questionable whether this type should be used for hot water applications, due to mud accumulations in piping and on interior surfaces of the boiler. But, with a cut-off outside the boiler, installed as in Fig. 2, there seems no need even for a blow-off valve on the equalizing connections to this control. I am confident, that when properly arranged, the velocity of the escaping water from an ASME pressure relief valve, would not be sufficient in value to hold the float of the low water cut-off in the closed position."

The thoughts of the correspondent are constructive and they suggest further comment regarding multiple relief valves, especially with current trend toward the use of not only boilers of small water content, but distribution systems as well. However, using one or more ASME relief valves, a primary small capacity valve can be set to open at the allowable working pressure of the boiler, and the secondary valves set to open in increments of 6 to 15 psi higher. The small primary valve will then relieve the small quantity of water from thermal expansion, should the expansion tank become water-logged, or it might be required to relieve a momentary pressure increase caused by the starting impulse of the pump. The larger secondary valve will only function when excessive temperature and pressure of the water result from uninterrupted firing of the boiler.

With the exception of two of the largest commercial steel heating boilers now being fabricated, a ¾ inch relief valve can be obtained with a water rating of sufficient capacity for thermal expansion of a boiler having a 9,000,000 Btu per hour output. In any event, a primary relief valve smaller than ¾ in should never be used; nor should a single primary relief valve of large capacity be used, since it increases difficulties for the valve to automatically close tight. Trouble may be due to larger seating surface, thicker metal seating surface, and the limited lift of the disk from the seat.

A relief valve should be connected to the top of the boiler with the spindle vertical. A Y-base, Fig. 1, may be used where there is more than one relief valve. There should be no shut-off valve between the relief valve and the boiler, or on the discharge piping. The discharge pipe should be arranged to avoid scalding one nearby. Relief valves should be sized for the actual gross boiler ouput, since some boilers under field conditions are fired beyond normal ratings.

Flow and Fan—

Principles of Moving Air through Ducts

C. HAROLD BERRY

Gordon McKay, Professor of Mechanical Engineering, Harvard University

Part 11. Fan Selection and Rating

This 12-part series continues with an extension of the discussion of fan selection criteria. A chart for selection of one out of a series of similar fans is developed, after the opening demonstration of the effect of errors in computing system resistance.

IN discussing the resistances comprising what we have called the system resistance, we have remarked the uncertainty that affects some of the available data. Do what we may, it sometimes happens that the resistance forecast for the system is smaller or larger than the actual resistance of the system after it is built. Naturally, the fan is selected to meet the computed forecast; the actual resistance cannot be known until the fan and system are installed and operating when it is too late to change the fan choice. Therefore it is interesting to consider what the effect of errors will be, and after that to consider what may be done to remedy the situation, if it is intolerable.

We have seen that the system resistance is a function of the volume flowing through the system, and that the relationship is most easily shown graphically by the system parabola (see Part 6). We have also seen that the fan characteristic is represented graphically. For a given system and a given fan, where will the operating point fall, that is, what volume will flow, and what pressure will be developed by the fan? The operating point must fall at the intersection of the fan characteristic and the system characteristic, Fig. 57. If, due to some transient disturbance, the flow assumes a higher value, the pressure developed by the fan will be reduced, and the system resistance will be increased. The fan pressure will be inadequate to sustain flow at this rate; the flow will drop, and as it drops the system resistance will fall while the fan pressure will rise; when they become equal, the variation must cease. Contrariwise, if the flow is momentarily reduced below the point of intersection, the fan pressure will be greater than the system resistance, and the flow will increase until the two become equal. Fan and system, whatever their nature, can operate together only at the point where their characteristic curves intersect.

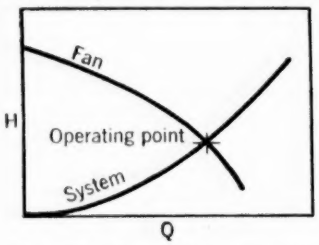
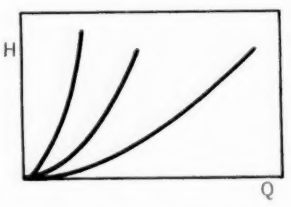


Fig. 57. Fan and system characteristic curves intersect at the operating point.

What happens to the system characteristic as the system resistance varies? We have already discussed this briefly in Part 6 and shown that, for a system including turbulent resistance, any increase of turbulent resistance so alters the system parabola that it becomes steeper, any decrease makes it less steep. Since the system with nothing but turbulent resistance is far the commonest, we shall carry out the present discussion for this kind of system. The conclusions will apply with minor modifications to any system.

The system resistance is equal to aQ^2, and the coefficient a increases as the resistance increases. Thus for variable system resistance we have a family of parabolas rising from the origin as in Fig. 58.



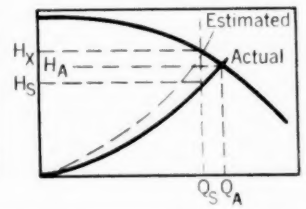


Fig. 58. (Left) System curves for various resistances.

Fig. 59. (Right) Effect of difference between actual and estimated resistance.

But we are not now considering a system of varying resistance, but a system for which the actual resistance differs from that which was forecast by the design computations. One of the parabolas in Fig. 59 represents the actual resistance of the system after it has been built; another shows the estimated resistance that was computed in design.

The fan has of course been chosen to meet the computed value. When the flow has a stated value, Q_s, the resistance was expected to be H_x. But it actually turns out that when the flow is Q_s through the real system, the resistance is H_s, the actual value. From the curves it is evident that the rate of flow Q_s cannot be sustained. The esti-

mated resistance being higher than the actual resistance, the fan has been chosen too big (or too fast) for the job, and the actual rate of flow will exceed the specified value. The operating point will fall at the intersection of the fan characteristic with the actual system characteristic, instead of at the intersection with the estimated curve.

If the estimated pressure is high by 10%, however, it is evident that the pressure developed in the actual system will be less than 10% above the pressure for the specified volume. The actual volume will be higher than the specified volume in the ratio of the square root of the ratio of the actual pressure H_a to the pressure H_s for the specified volume. These relations work together to reduce the relative error somewhat, so that the situation may be acceptable, save for the fact that the fan operates further out than was intended, and hence shows lower efficiency and requires higher shaft horsepower.

The extent of the increase in volume and power and of the decrease in efficiency clearly depends upon the steepness of the fan characteristic in the region of interest. If the fan chances to have a flat characteristic, the departures may be large; if it has a steep characteristic, the departures may be small, as in Fig. 60.

Fig. 60. Effect of slope of fan curve.

If the estimated system resistance proves to be smaller than the actual, the situation is reversed, as in Fig. 61, but again the course of the curves is such that the resulting errors tend to be somewhat reduced. However, it may be that the reduced volume cannot be accepted. For example, if the fan is furnishing air to support combustion, any reduction in the air quantity will reduce the fuel-burning capacity of the furnace. This is intolerable. The facts that a little less power is used, that the fan efficiency may be a trifle higher, and that the reduction in volume is a smaller percent than the error in computing resistance cannot compensate for the reduced capacity. Something must be done.

Changes to Compensate for Errors

An obvious remedy that is sometimes available is to alter the speed of the fan. If the fan is belt driven, a change of pulley diameters will do this at small cost. This is one of the advantages of a belt drive. If more air is wanted, the speed may be increased, and the fan laws tell us that the speed should be increased in proportion to the desired increase in volume. Likewise, if the volume is excessive, a proportional reduction in speed will correct it. In each case, it should be remembered, the required power will vary as the cube of the speed; if the fan is run faster the power will increase significantly, if slower there will be a noticeable saving. (These statements will not be exact for a system including viscous or constant elements of resistance, because any shift will change the operating point or equivalent orifice at which the fan works, with a corresponding shift in efficiency. For a purely turbulent system, the statements are exact, since the operating point remains fixed with changing speed.)

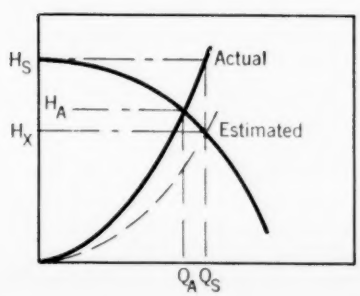


Fig. 61. Underestimated resistance.

If the fan is driven by a direct-connected motor the remedy is not so easy. The speed is fixed. Perhaps the manufacturer can suggest changes in the fan, such as installing a slightly larger wheel in the same casing. This is often a major undertaking, since large fans are often installed in tight places, sometimes being placed before the building is finished.

There is another possible remedy that should always be studied with great care in cases of this sort. The system resistance may be altered. If the volume is excessive, an increase in system resistance will effect a reduction in the desired volume. This is an easy remedy, although it seems regrettable deliberately to increase the resistance of a well-designed system. Nonetheless, dampers are often installed for this express purpose. Sometimes fixed resistances are installed.

If the flow is smaller than desired, the system resistance may be reduced to remedy the shortcoming. This is often difficult, especially if the system has been carefully designed for minimum resistance (as it should be). However, it often happens that a careful study of the system will disclose possibilities of relatively inexpensive changes that will decrease resistance. One of the commonest of these possibilities is the installation of splitters in turns and other fittings. In one case that has been discussed publicly, this change corrected a thirty percent deficiency.

Margins of Alleged Safety

In designing a system and estimating its resistance, there are uncertainties that may induce one to ensure satisfactory service by selecting a fan for higher pressure than has been estimated. This possibility is especially likely in a system comprising several pieces of equipment for which the resistances are given by the manufacturers. Each manufacturer may state the resistance of his equipment with a moderate allowance on the high side. The system designer adds all these figures, and adds another allowance of his own, just to be sure that the fan he selects will not fall short.

Consider what this means if a forwardly-curved blade fan is chosen. The fan has been selected to meet a pressure-volume point that is higher than the system actually gives. The operating point shifts along the fan characteristic to the right from the point of selection, Fig. 62. The horse-

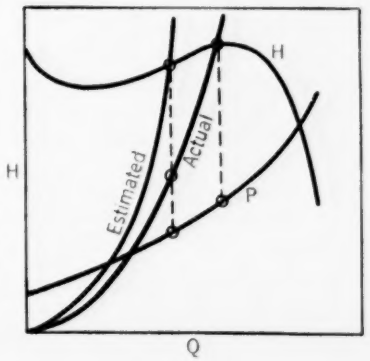


Fig. 62. Selecting a fan for higher pressure and volume than is required may result in excessive horsepower requirement.

power accordingly rises along the power curve, which for some fans rises rather rapidly. The load on the driving motor is higher than was forecast, and it may be that the motor will be overloaded. It may burn up. Replacement with a larger motor is troublesome and costly.

It is not always good engineering to make allowances in this direction. If the fan is to be belt driven, we may count upon changing pulleys to adjust the speed. If other drive is intended, the best we can do is to estimate the resistances as accurately as possible, and rest on the result. If a backwardly curved blade fan with self-limiting horsepower is to be used, there will of course be no anxiety on the score of motor capacity, which will be chosen to carry the maximum fan load.

Modification of Fan Selection Methods

Engineers in the fan business often prefer to follow a somewhat modified procedure in computing the required size of a fan for specified duty, when the specified gas density differs from the gas density for which the test fan curves are plotted (which will be called the standard density).

Their first step is to convert the specified duty to what it would be if the density had the standard value.

For instance, in the examples given in Part 10, the specified values were $Q_1 = 110{,}000$, $H_1 = 7.4$, $\rho_1 = 0.045$ and the test fan curves were plotted for $\rho_0 = 0.075$.

One may convert the specifications to the values that they would assume if the gas density were to be 0.075 (using the density law). Q is unaltered, and H (in pressure units) is proportional to the density. Thus the converted specifications become

$$Q_1 = 110{,}000;\ H'_1 = 7.4\,\frac{0.075}{0.045} = 12.33 \text{ inches w. g.}$$

This done, the required fan diameter is worked out as indicated, but the density cancels out of the equations, and somewhat simplifies the arithmetic.

The required power must of course be computed for the actual pressure developed by the specified fan, i.e., the density ratio must be included.

Graphical Method for Selecting a Fan

This method seems complex in its description, but it leads finally to a chart whereby results may be found expeditiously.

The method assumes that the required fan and the test fan handle gas of the same density. That is, the specifications are modified for density as the first step of the solution. As has been mentioned, the density of air handled by the test fan will be called the standard density (it is usually 0.075 lb per cu ft).

Two constants are used, derived from the dimensionless constants given in Part 8. Graphical means are developed for computing one of them, and the other is incorporated in the computations for one of the scales of the final chart.

We shall discuss the various items.

Tip Speed

To simplify the final chart, we use the square root of constant (b) defined as $H/(D^2N^2\rho)$ and, since all fans considered are handling gas of the same density, we omit the density from the constant. This destroys the dimensionless character of the constant, but does not alter its constancy. We shall call this new constant (b′).

$$(b') = \frac{H^{1/2}}{D\,N}$$

The stress in a rotating ring is proportional to the square of the peripheral speed, or tip speed, and some relation not far from this is true for any rotating wheel-like structure, such as the fan impeller. Accordingly, in this method of fan selection, the tip speed is used as the criterion of the strength and stiffness of the fan wheel.

Tip speed, in fpm, is $\pi D\,N$ if D is in feet and N is in rpm.

Constant (b′) thus relates the pressure developed by the fan to the tip speed of the fan impeller. Two similar fans operating at the same equivalent orifice will run at tip speeds proportional to the square root of the pressure developed.

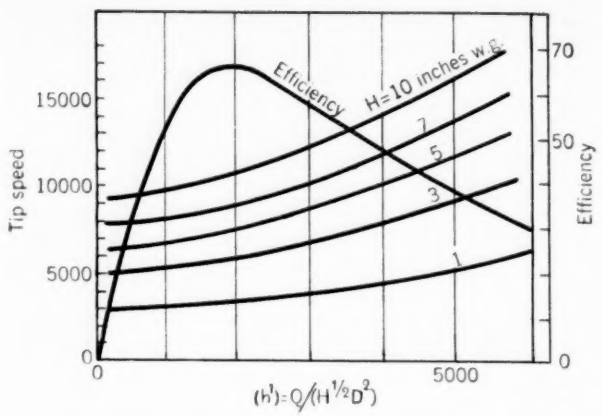


Fig. 63. Family of pressure curves for SXW fan series showing variation with tip speed and constant (h′).

Computing the Tip Speed of the Test Fan

Consider the test fan, Type SXW, Size 6 (test curves in Part 9). The fan wheel diameter is 36 inches = 3 feet, and it runs at 600 rpm. Accordingly the tip speed is $\pi D\,N = \pi \times 3 \times 600 = 5655$ fpm. At a given point of rating, e.g. $Q = 30{,}000$ cfm, the pressure developed on test is 2.96 inches w.g. Accordingly, any similar fan, running at this same point of rating and developing this same pressure, will run with a tip speed of 5655 fpm. The bigger the fan, the lower the rpm.

Further, any similar fan (or the test fan itself), running at this same point of rating, but at such speed that it develops a different pressure, will run at a tip speed proportional to the square root of the pressure developed. That is, constant (b′) will have the same value for the two fans.

$$\frac{H^{1/2}}{D\,N} = \frac{H_0^{1/2}}{D_0\,N_0} = \text{constant} \qquad (220)$$

The tip speed of the fan will therefore be

$$\pi\,D\,N = \frac{\pi\,H^{1/2}}{(b')} \qquad (221)$$

Thus if we compute the value of (b′) for various points

TABLE 7—VALUES FOR CONSTANTS (b') AND (h') AT VARIOUS RATINGS

Test Data		$(b') = \frac{H^{1/2}}{D\,N \times 10^4}$	When H (Inches w.g.) is					$(h') = \frac{Q}{H^{1/2}\,D^2}$
Q	H		1	3	5	7	10	
			Tip speed (fpm) is					
10,000	3.75	10.75	2921	5060	6530	7730	9240	574
20,000	3.50	10.39	3022	5230	6755	7995	9950	1188
30,000	2.96	9.55	3288	5690	7350	8700	10397	1939
40,000	2.12	8.09	3884	6720	8680	10280	12281	3052
50,000	1.03	5.64	5570	9640	12455	14738	17312	5475

on the test curve, we can then compute values of tip speed for any similar fan (or the test fan itself), running at the respective points of rating, and developing any pressure. Table 7 gives a few scattered values for illustration of this type of compilation.

The Orifice Ratio

As before, we use the square root of the constant (h), defined in Part 8 as $Q^2\rho/(H\,D^4)$, and omit the density, thereby securing another constant (not dimensionless) which has the same value for two fans operating at the same point of rating.

$$(h') = \frac{Q}{H^{1/2}D^2}$$

The denominator of (h'), with a suitable constant factor (e.g. $1000\,\pi$ for usual units) gives the quantity, cfm, of air of standard density that would flow through a well-rounded nozzle with a throat diameter equal to the diameter of the fan wheel. Equations 113, 167 and 181 (Parts 5 and 6) are all in agreement with this, although their various forms differ because of their context. Thus the constant (h') is the ratio of the quantity actually handled by the fan to the quantity that would flow through a well-rounded nozzle with a throat diameter equal to the diameter of the fan wheel, if the pressure developed by the fan were applied to such a nozzle. Hence this constant (h') is sometimes called the orifice ratio of the fan. For two fans operating at the same point of rating, the value of (h') is the same.

Tip Speed Curves

We now wish to compute many values of tip speed, for various pressures developed, and plot them against constant (h'). Since the abscissa of the plot will be a constant for all fans at the same point of rating, the final plot will apply to any fan of the SXW series, whatever its size.

A family of curves, with H as parameter, plotting tip speed (fpm) against the value of (h') is shown in Fig. 63 based on data from Table 7. Superposed on these tip-speed curves we also plot the efficiency of the fan against the constant (h').

With these curves, the task of selecting a fan for a given duty becomes one of computing the value of $(h') = Q/(H^{1/2}D^2)$ for various standard fan sizes, and locating points on the tip-speed curve for the specified value of H, whereupon we can read directly the required tip speed, and the fan efficiency, and select the size of fan that gives the most desirable combination of efficiency and tip speed. For a given fan diameter, the rotary speed is readily computed from the tip speed, and is of course taken into consideration, especially for direct-connected motor drive, as discussed in Part 10.

$$\text{Tip speed} = S = \pi\,D\,N, \text{ hence } N = \frac{S}{\pi\,D} \qquad (222)$$

with D in feet, S in fpm, and N in rpm.

Computing the Constant

Consider two superposed sets of rectangular coordinates. For one set, the abscissa is Q and the ordinate is $H^{1/2}$. For the other set the abscissa is the constant (h') and the ordinate is $1/D^2$ as drawn in Fig. 64.

Locate the point A by the specified values of Q and H. Draw a straight line to the origin. This intersects a horizontal line located by the diameter of one fan of the SXW series. From similar triangles, we have

$$\frac{Q}{H^{1/2}} = \frac{X}{1/D^2}$$

whereupon

$$X = \frac{Q}{H^{1/2}D^2} = (h')$$

Horizontal lines may be drawn for the various standard sizes of the SXW fan, and it becomes an easy matter to find the value of (h') for any one of the fans for any specified values of Q and H.

It will be evident that the scales of Q and $H^{1/2}$ must be in the same ratio as the scales of (h') and $1/D^2$, and that the scales are otherwise arbitrary. Thus the scale of Q may be made to cover the expected range of applications for the type SXW fan.

The Hagen Diagram

The foregoing plots are combined to make up what is known as the Hagen diagram, after its inventor. A small diagram of this sort for the type SXW fan is shown in Fig. 65.

It will be noted that the scale of (h') is not indicated, since it is an intermediate quantity of no final interest.

Against each standard diameter of the series is given a constant which, multiplied by the tip speed, gives the rotary speed, rpm. From equation (222) it is clear that this factor is

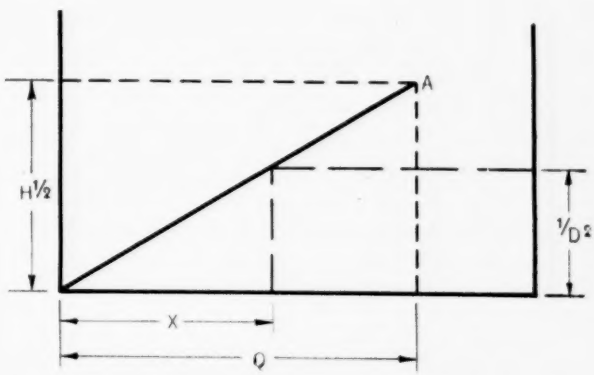


Fig. 64. Superposed coordinates for determination of (h') for SXW fan series.

$$K = \frac{1}{\pi D} \text{ (D in feet)} \qquad (223)$$

For simplicity, the series SXW has been assumed to comprise as standard sizes fans with wheel diameters of 30, 36, 42, 48, 54, 60 inches, i.e., 2.5, 3, 3.5, 4. 4.5, 5 feet. It is recognized that this is not in accord with the commercial practice of having the diameters in geometric progression with a ratio of about 1.1 but this does not affect the usefulness of the diagram as an illustration.

Plotted on the diagram are dotted lines for the fan selection worked out in part 10.

Q = 110,000 cfm, H = 7.4 inches w.g., ρ = 0.045 Modifying the pressure to standard density gives

$$H' = 7.4 \frac{0.075}{0.045} = 12.33 \text{ inches w.g.}$$

Locating the joint Q = 110,000 and H = 12.33 we draw a straight line to the origin. This intersects the horizontal lines for the various standard fans of the series. Vertically above these intersections we read from the tip speed diagram, for H = 12.33, and find that the 36-inch fan runs at excessive tip speed, and at low efficiency. The 42-inch fans runs at tip speed = 12600 fpm, which may be acceptable, and with an efficiency of a trifle over 61%, which is perhaps not too bad. The constant K = 0.091 and the rotary speed is 12600 × 0.091 = 1147 rpm, which agrees with the specified speed (1150). (Compare the results computed in Part 10.)

From the chart it seems evident that the 48-inch fan would run at tip speed = 11600 fpm and rotary speed = 11600 × 0.080 = 928 rpm, and with effiiciency = 65%. Thus, with the aid of the Hagen chart, we are able to learn quickly that the 48-inch fan would give higher efficiency, but would not meet the specified speed. To run at 1150 rpm it would have to run at tip speed = 1150/0.080 = 14370 fpm, and then it would develop excess pressure and, of course, deliver larger volume than that specified.

The Hagen diagram is a time saver, and it might therefore be worthwhile for a fan manufacturer to plot it for each of his established series of fans, so that selections can be made quickly. Naturally, the diagram should be larger than that here given. Clearly, the user would not find plotting one profitable for infrequent use. For him the methods outlined previously should suffice.

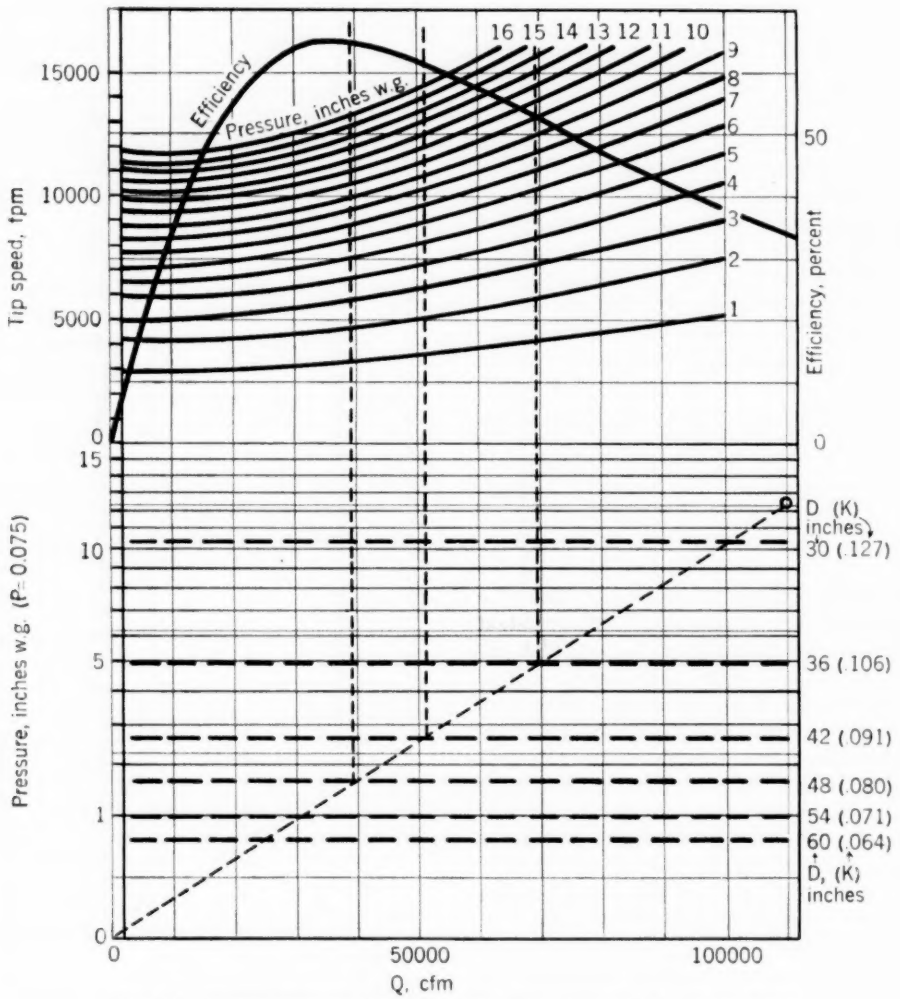


Fig. 65. Hagen diagram type SXW fan. The constant (K) on the right hand scale, multiplied by the tip speed, gives the rotary speed in rpm. Broken diagonal and vertical lines illustrate example in text.

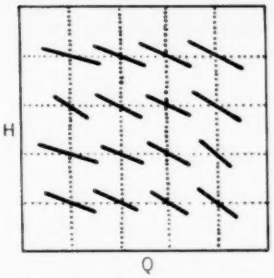


Fig. 66. Diagram of a manufacturer's rating table of volume vs. pressure.

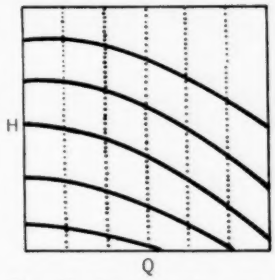


Fig. 67. Diagram of a manufacturer's rating table of speed vs. pressure.

Fan Rating or Capacity Tables

Fan manufacturers customarily publish data on the performance of their fans in the form of tables in which each line corresponds to a stated volume of air having standard density (0.075) and each column corresponds to a stated pressure developed by the fan. (This is often the fan static pressure to which the velocity pressure can be added to give the total pressure developed by the fan.) At each intersection, two values are given, namely the speed and the power. Such a table presents points lying in a square array in our familiar diagram, and through each point we might imagine an arc of a characteristic curve to be drawn as in Fig. 66. For each of these curves the fan must run at a different speed (coincidences apart). The various points will not in general be corresponding points, that is, the tabulated points do not represent the oppation of the fan at the same equivalent orifice.

From these data it is easy to compute at least part of the pressure characteristic curve for any assumed constant speed (using the 1-2-3 Law of Part 8), if such a curve is needed.

Occasionally the published tables are arranged in other ways. In some tables each line corresponds to a stated speed, each column to a stated pressure. Then each line is merely a succession of points read from the constant-speed characteristic curves, giving volume and power, as in Fig. 67.

Manufacturers are sometimes reluctant to furnish complete data on their fans. The reasons for this are various, occasionally obscure, and often seemingly unjustifiable to the user who wishes sufficient data to support intelligent consideration of his problem.

Next month this series will conclude with a discussion of fan operation.

High-Resolution Micromanometer

A highly sensitive micromanometer, designed to measure differential pressures as low as 0.03 micron of mercury (0.00003 mm Hg or 1.6×10^{-5} in. water) with resolutions of the order of 0.001 micron Hg, has recently been developed by T. A. Perls, W. H. Kaechele, and D. S. Goalwin of the National Bureau of Standards. The NBS micromanometer utilizes a thin diaphragm combined with a capacitance-type pickup and a resonant-bridge carrier system to detect pressure differentials 100 to 1000 times smaller than previous systems. Besides measuring static differential pressures, the micromanometer can sense with an accuracy of better than 2% pressures that are varying at rates up to 20 cycles per second.

A major limitation in the field of basic instrumentation has been the difficulty of sensing very small displacements accurately. This problem arises in various instruments which utilize diaphragms as a means for converting small changes in pressure to mechanical displacements. For instance, the extreme sensitivity of a thin metal diaphragm separating two pressure-tight cavities can be utilized as an accurate temperature control. Here minute changes in temperature cause a pressure differential between the two cavities, which, in turn, makes the diaphragm deflect.

The micromanometer developed by the Bureau consists of a 3-inch diameter corrugated diaphragm made of brass sheet 0.001 inch thick and mounted in a shallow cylindrical cavity. The diaphragm is placed so as to divide the cavity into two pressure-tight chambers. An insulated electrode passes through the top of the cylinder to become one side of a variable capacitor; the flexible diaphragm forms the other side of the capacitor, which then has a nominal capacitance of about 20 micromicrofarads. Changes in either temperature or pressure within one of the cavities will cause the diaphragm to flex and move. This motion varies the electrode-diaphragm spacing and, consequently, the capacitance of the system is changed by a small amount. Over the mechanical operating range used, the displacement of the diaphragm varies directly as the pressure differential, and the changes in capacitance also vary linearly with the displacement of the diaphragm. The electronic portion of the NBS micromanometer has sufficient range of sensitivity to respond, with an accuracy of 2%, to full-scale changes between 0.005 and 0.2 micromicrofarad above and below the 20-micromicrofarad capacitance of the system.

A micromanometer using a capacitance-type pickup and resonant-bridge carrier system depends for its high resolution on the area and thinness of the diaphragm and on the sensitivity of the electronic circuit. Deflections of the order of one millionth of an inch (full scale) and capacitance changes of 0.005 micromicrofarad are involved. In resolution and sensitivity, the NBS micromanometer shows a decided improvement over other devices also designed to measure static and semi-static differential pressures with the aid of diaphragms. Some prior developments in this field include micromanometers that use an unbonded-wire strain gage or a mutual inductance pickup to detect the displacements of the diaphragm. The best resolution that has been obtained with these systems is about 0.1 micron Hg.

Although designed to measure differential pressures, the NBS micromanometer can be modified to measure absolute pressures below 1 micron in apparatus where the presence of mercury, oil, or other liquid is undesirable. This may be accomplished either by maintaining a high vacuum on one side of the diaphragm or by sealing one side at a high-vacuum level. The instrument should be useful for calibrating ionization gages.

Plumbing Courses Offered in Vocational Schools

NATHAN N. WOLPERT

PLUMBING COURSES AVAILABLE IN VOCATIONAL SCHOOLS

Location	School	Hours Per Wk		Length of Course, Weeks	Time of Course	Students Admitted	Prerequisites	Objective of Course
		Shop	Class					
CALIFORNIA								
San Diego	San Diego Vo.	1½	3½	5 yrs	E	Anytime	Apprentice	Journeyman
CONNECTICUT								
New Britain	E. C. Goodwin Tech.	20*	2	40	D	Sept., Feb.	8th grade	Train for journeyman
		3	2	24	E	Sept.	Employ. in trade	Upgrading adults
Norwich	Norwich Reg. Vo.	5	1	4 yrs	E	Anytime	Plumb. apprentice	Apprentice training
FLORIDA								
Orlando	Orange County		3			Anytime	Apprentice	Train for journeyman
GEORGIA								
Augusta	Augusta Vocational	15	5	9 mo	D	Sept., Feb.	8th grade	Mechanic training
Savannah	Savannah Vo.		4**	36	E	Monthly	Employ. in trade	Trade advancement
INDIANA								
Evansville	Mechanics Art School			144 hrs	E	Nov., April	Apprentice	Apprentice training
KENTUCKY								
Louisville	Ahrens Trade Night		5	576 hrs	E	Sept., June	Apprentice	Apprentice training
MASSACHUSETTS								
Fitchburg			6	25	E	Oct., April	In trade	Apprentice training
Quincy	Quincy Trade	30†	10	3 yrs	D	Anytime	8th grade	Train for journeyman
MISSOURI								
Appleton	Appleton Vo.		4		D	Anytime	Apprentice	Apprentice training
St. Louis	The David Rankin, Jr.	18	16	18 mo	D	Anytime	8th grade	Technicians
	School Mech. Trades	3	1	36 per yr	E	Anytime	8th grade	Upgrading industry
NEW JERSEY								
Merchantville	Camden Co. Vo.	15*	7	40	D	Anytime	8th grade	Prepare for industry
		2*	2	72	E	Anytime	Employ. in trade	Advancement in trade
		1½*	6	96	E	Anytime	Apprentice	Train for journeyman
Hackensack	Bergen Co. Vo.	15	7½	38	D	Sept.	9th grade	Trade extension
New Brunswick	Middlesex Co. Vo.	15	15	3 yrs	D	Anytime	8th grade	Training in art
NEW YORK								
Canton	Canton Ag. & Tech.	3	2	36	D	Sept.		Trade advancement
OHIO								
Massillon	Washington H.S.		4	24	D	Sept.	H.S. grad.	Train for journeyman
OREGON								
Eugene	Eugene Vo.		6	24	E	Anytime	Employ. in trade	Train for license
PENNSYLVANIA								
Erie	Veterans' School	3	3	24 per yr	E	Oct., Nov.	Employ. in trade	
SOUTH CAROLINA								
Denmark	S. C. Area Trade Schools (Negroes)	15	15	104	D	1st Monday in month	H.S. grad.	
TENNESSEE								
Memphis	Memphis Vo.		6	24	E	Sept., Mar.	Apprentice	Train for journeyman
UTAH								
Salt Lake City	Salt Lake City Area Vo. School		6	25	E	Sept., Mar.	Employ. in trade	Theory and training for apprentices
VIRGINIA								
Abingdon	Washington Co. Tech.	25*	3	36	D	Sept., Jan.	7th grade	Resid. plumb.-heat.
Richmond	Va. Mech. Inst.		6	30	E	Sept., Oct.	Employ. in trade	Apprentice training
WISCONSIN								
Menasha	Vocational School		4	36	D	Anytime	Employ. in trade	Train for journeyman
Oshkosh	Vo. and Adult School	4	2		D	Anytime	Employ. in trade	Train for journeyman
Sheboygan	Vocational School	½	3	36 per yr	D	Anytime	H.S. grad.	Train for journeyman

*Plumbing and heating
†Thirty hours weekly every second week; 10 hrs of 30-hr shop week on alternate weeks devoted to class
**Combined shop and classroom work

(*Continued on page* 130)

What Would You Do?

Replies to engineering and operating problems of interest to the industrial plant engineer

Conducted by
NATHAN N. WOLPERT
Associate Editor

THE convenience and the labor-saving benefits for owners of snow melting systems in driveways have been the driving factors in the spread of this type installation. While a snow melting system for a residential driveway is fully appreciated, such a system for the driveway to an industrial plant is mandatory to permit material to flow in and out of the plant unhampered by a snow-blocked driveway.

In addition to the pipe coils under the road surface being large enough to melt the snow, there must be sufficient cover over the pipes to prevent the heavily loaded trucks from damaging the pipe.

A plant engineer has asked some pertinent questions regarding snow melting systems that should be of interest to others. They constitute the problem for discussion this month. Should you have a problem that you would like to see treated in this department, or if you have a discussion that you would like to contribute regarding the coming problem, you are invited to write to the Editor.

Here is the Problem

In planning a snow melting system for a truck driveway from the highway to our plant, a distance of nearly 300 ft, is it possible to use some other mix instead of concrete to embed the pipe? If so, how would you rate it in effectiveness as compared to concrete? How thick should the slab be above the pipe for good results and what should be the fill below the pipe? What should be the temperature of the hot water through the embedded coils?

This Month's Problem

Many satisfactory snow melting systems are in operation under bituminous pavements. It is important that the spacing of the pipes forming the coils or grids should be not more than 12 inches on centers and one inch pipe is recommended.

It is assumed that heavy trucking over this driveway will call for a substantial type of construction. Therefore, the finished compacted covering of paving material over the pipes should be three inches thick rather than two inches which would be usually specified and which is the recommended minimum covering thickness for concrete paving. The base fill for the driveway should be washed gravel or crushed stone which should be thoroughly compacted before installing the pipe. The thickness of the base will be dependent upon the expected loading, soil conditions, and other factors of which we do not have knowledge. It is important that cinders, slag, soil or other corrosive materials should not be used or be in contact with any of the other piping. The bituminous paving material should cover and surround the coils or grids without voids. Unusual subsoil dampness, and lack of drainage should call for at least one heavy coat of asphalt or bituminous paving material over a compacted layer of the base followed by an additional layer of compacted base material before placing the coils or grids.

An anti-freeze solution is recommended. While solution temperatures are subject to a number of climatic factors and assumed design conditions, it is suggested that the temperature of the solution at the inlet to the system should be 140 to 160F, and the permissible design temperature drop should be in the range from 20 to 40F. Since these temperatures are below ordinary summer temperatures of the pavement, no softening of the paving material, should result.

J. L. McKinley
Public Service Company of Colorado
Denver, Col.

The design of a snow melting system for a truck driveway is dependent on several factors:

(1) The rate of snowfall per hour in inches of water equivalent. Rates commonly used, depending upon the locality, are 0.08, 0.16 and 0.25.

(2) The air temperature.

(3) The wind velocity.

(4) The free area ratio or the ratio of the surface free from snow to the total surface. When there is no snow, this ratio is 1. When the entire surface is covered, the ratio is 0.

The fluid temperature and the slab output in Btu per sq ft per hour will vary accordingly, with fluid temperatures between 240 and 60F, and the slab output between 400 and 65 Btu per sq ft per hour.

The coil surface is commonly constructed of ¾ inch or 1 inch tube on 12-inch centers, with a minimum of two inches of concrete above and below the pipe. The actual

(*Continued on page* 130)

Problem for the Coming Issue

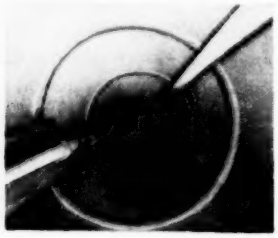
For training operating personnel, do you have a set of regulations for the men to follow when balancing an air conditioning system. I am not interested in a small size system.

NEWS OF EQUIPMEN AND MATERIALS

Use the prepaid postcard opposite page 119 for securing additional information on items described in this department.

Lining for Hot Water Tanks

Positive protection against corrosion of new and old hot water generators and storage tanks can be obtained through Metalweld Plasticote, a nonporus insoluble lining announced by Metalweld, Inc., Philadelphia, Pa. Photos show tank before (left) and after (right) application. The lining, applied by trowel to a thickness of 3/4-inch around internal surfaces, greatly extends the life of new equipment as well as equipment that has become corroded and pitted. It saves replacing expensive tanks and eliminates maintenance costs since annual cleaning, scraping and painting are no longer required.



The lining also provides extra insulation, reduces heat loss and solves the rusty water problem. Application takes less than 24 hours. The work is done by field crews within a 250 mile area of the company's plant.

More information? Circle Item 1 on postcard, page 119

Tankless Water Heater

The all copper AquaHeater, a compact tankless water heater with finned copper coils enclosed in a high strength copper shell insulated by fiberglas and encased in an attractive metal jacket, is announced by Joseph E. Lewis & Company, Inc., Baltimore, Md. Features include a built-in water hammer eliminator and ribbed heads of the copper shell. The cone-shaped water hammer eliminator is so designed that it also serves as a baffle to deflect hot boiler water over the finned coils. The heads of the copper shell are ribbed for added strength giving the effect of using a quarter inch plate in supporting the heavy brass fittings used for both domestic and boiler water connections.

The heater is light enough so that one man can install the unit in any of the three sizes made, 4, 6, or 8 gpm.

A 15 year guarantee is extended on each heater upon installation information mailed to the company.

More information? Circle Item 2 on postcard, page 119

Entry Alarm for Offices, Stores

Announcemat, a packaged unit which is used to give an entry alarm in business offices or stores and homes, is introduced by Recora Co., Chicago, Ill.

The basic unit is a Switchmat, an extended area electrical switch. A plug-in type transformer and a bell, chime or buzzer are included. A step on any part of the Switchmat causes alarm to sound; alarm stops when person steps off mat.

The floormat switch is available in two types, barefloor and undercover. The latter can be concealed under rugs or carpets; the former has tapered edges to prevent obstructing foot traffic. The floormat switches are composed of durable vinyl plastic and/or rubber, and are waterproof.

Switches come equipped with 25 feet of wire for connection to transformer and alarm device. Door can be held ajar for ventilation purposes without affecting alarm action.

Price is $22.95.

More information? Circle Item 3 on postcard, page 119

Oil Pressure Reducing Valve

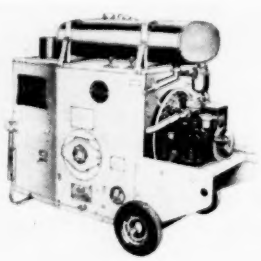
A new oil pressure reducing and regulating valve has been added to its line by Eclipse Fuel Engineering Co., Rockford, Ill.

This new valve is a single seated, spring loaded, direct acting diaphragm type. It automatically reduces high pressure to low pressure and maintains the low pressure regardless of fluctuations on the high pressure side.

More information? Circle Item 4 on postcard, page 119

Portable Gasoline Heater

A redesigned standard model Herman Nelson portable air heater is announced by American Air Filter, Inc., Moline, Ill. It is powered with a new Briggs and Stratton Model 6 engine. Use of this streamlined, more powerful engine has permitted modification in engine mounting, resulting in a much simpler, cleaner arrangement of components at the air intake end of the heater.

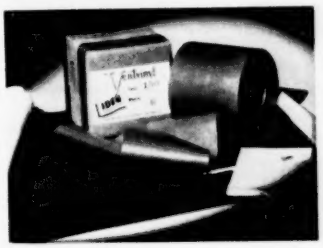


A new addition is a fuel metering valve which can reduce the capacity of the unit from its maximum 385,000 Btu to a low of 100,000 Btu per hour. This permits considerable saving in fuel consumption at the lower, frequently desired capacities.

More information? Circle Item 5 on postcard, page 119

Duct Connecting Fabric

Ventvinyl is the name of a closely woven glass fabric with vinyl plastic finish used for flexible connections on domestic heating units or ventilating and air conditioning duct work. The product is made by Iden Associates, Chicago, Ill.



The fabric will not tear, unravel, or fray when worked with sheet metal, is fireproof and will not leak air.

French gray with a high gloss finish, the material harmonizes with ducts and heating units and can be washed or dusted. It is available in rolls 6, 8, or 10 inches wide and 150 feet in length.

More information? Circle Item 6 on postcard, page 119

Edge Type Fuel Oil Filter

An edge type plate fuel oil filter, to be used with the company's closed flame gas-oil burner, has been added to its line by Eclipse Fuel Engineering Co., Rockford, Ill. This filter is said to separate all solids from fuel oils easily and quickly without stopping oil flow.

Thorough filtration is accomplished by passing the oil between discs of metal, precisely separated by spacers of the right thickness for the particular oil to be used. Solids larger than the spaces between the discs cling to the edges, and only clean oil passes through.

More information? Circle Item 7 on postcard, page 119

Remote Bulb Aquastat

A remote-bulb hot water control has been added to the line of fast-acting, liquid filled Aquastats made by Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

Micro-switches are used in all models of the new unit to provide a complete line of switching action. Direct or reverse action is provided in the L4008 model while combination single-pole, double-throw action is available in the Model L6008.

The bulb on the new controller can be placed directly in the boiler, tank or other vessel. When it is used in the boiler the bulb may be placed directly in the boiler water or in the supply line and may be mounted in any position.

The control unit can be placed as far from the bulb as the capillary will permit. Standard length of the capillary is 60 inches; however, other lengths are available.

The remote bulb may be installed in an immersion well or placed directly in the controlled liquid. When located in the boiler liquid, compression fittings are used to seal off the fluid at either the bulb or capillary.

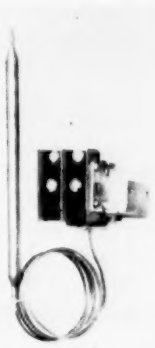
More information? Circle Item 8 on postcard, page 119

1 and 2 Step Conditioner Controls

Single step and two step air conditioning controls as pilot devices for panel assembly on packaged units have been developed by Cutler-Hammer, Inc., Milwaukee, Wis.

These controls regulate air temperatures produced by commercial air conditioning units and provide approximately 2 deg. differential over a range of 65 to 95 deg. F. The controls feature cross ambient fill of the power element which assures positive control of the air stream regardless of room temperature.

The single step control, Type TZ (top view), uses one micro switch and is designed to operate with the bulb in the air stream.



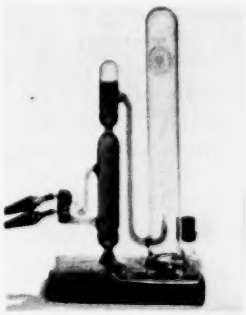
The two step control, Type TZZ (bottom view), is designed for units which provide cooling capacity in two steps, incorporates two micro switches, and operates on the same efficient principle as does the single step control.

Both the single step control, Type TZ, and the two step control, Type TZZ, are engineered to meet individual manufacturer's specifications.

More information? Circle Item 9 on postcard, page 119

Heat Operated Pump

A heat-operated pump, said to offer specialized advantages over mechanical pumps has been developed by Jet-Heet, Inc., Englewood, N. J.



Unlike mechanical pumps, the low-cost device, called Thermo-Pump, can be made entirely of glass and hermetically sealed, enabling safe pumping of dangerous or corrosive liquids or chemicals. It has no moving parts except check valves, operates indefinitely and silently.

Other applications include pumping fuel oil for such devices as small stoves, furnaces and blow-torches, and pumping refrigerants, as in absorption refrigerators, where waste heat can be fed back to power the pump.

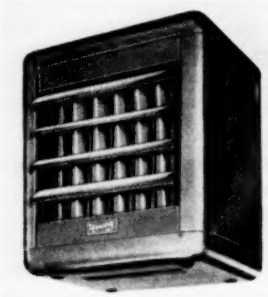
Lower in efficiency compared to mechanical pumps, it can also operate where electric or mechanical power is unavailable or inconvenient, as in certain laboratory situations or inaccessible regions.

Based on a simple principle of vaporizing and condensing liquids, the pump operates on very small amounts of either electric or flame heat.

More information? Circle Item 10 on postcard, page 119

23 In. High Gas Unit Heater

The G-50, a compact gas-fired unit heater with an input of 50,000 Btu per hour has been added to the line of Young Radiator Co., Racine, Wis.



The new heater is designed especially for thousands of low ceiling and small space applications. The 23-inch-high unit heater is direct-fired into the tubes of welded, 16 gage aluminized steel heat exchanger.

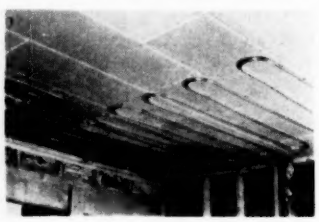
A number of the features of the unit are: completely welded and gas-tight steel heat exchanger; die-formed casing finished in neutral grey baked enamel; draft diverter with built-in side relief openings; totally enclosed, shaded pole, resiliently-mounted motor; heavy cast iron burners with precision drilled ports for use with manufactured, mixed, natural, LP or LP-air gases; electric solenoid gas valve; combination 100% shut-off valve; high temperature limit control; pressure regulator; quiet-running, four-blade aluminum fan; fan control; and two-point suspension hangers.

Catalogs 2752 and 2753, providing complete capacity table and dimension data on the company's gas-fired unit heater line are available.

More information? Circle Item 11 on postcard, page 119

Pre-formed Panel Heat Grids

Pre-formed grids of copper tube for radiant panel ceiling heating installations are announced by The American Brass Co., New York, N. Y. They are designated as PG's, and are made of ⅜ inch Type L copper water tube. Each panel grid contains approximately 50 linear feet. At normal 6 inch spacing along the centerline, the grid is rated at 1800 BTU, and at this spacing measures about 56 inches wide by 60 inches long serving a ceiling area of 30 square feet. One end of the unit is expanded so that the grids are easily solder-connected in series without the need of fittings.



The grid is so designed that by merely contracting or extending by hand it can be installed in a way that the tube spacing will meet all design requirements. Over windows, doors and along outside walls where heat loss is greatest, the grid is easily contracted, if desired, to 4½ inch tube spacing. Conversely, as the grids are installed towards the center of the room, and less heat output per square foot of ceiling is required, the grid can be expanded up to a tube spacing of 12 inches. This flexibility in tube spacing means that a single grid can serve ceiling areas ranging from 22½ to 60 sq ft.

Considerable time is saved over the usual method of bending coils on the job, or forming them in the contractor's shop, and fewer fittings and fastenings are required. The straight and trim panels fasten tightly to the ceiling construction, thus avoiding the necessity of an excessive thickness of plaster. The grids are equally suitable for rock lath or metal lath construction. The grids weigh approximately 10 pounds each and are packed four to a carton for easy handling. Booklet is available.

More information? Circle Item 12 on postcard, page 119

Simple Brazing Method

Braze-Clad metals, consisting of ferrous or non-ferrous metal strips clad with layers of silver brazing alloy and intended for bonding metals together are introduced by Industrial Div., American Silver Co., Inc., Flushing, N. Y. In joining metals, the brazed strips are placed along the area to be joined, heat applied, and the braze is complete.

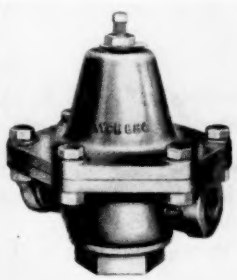
The strips are available in coils or straight lengths in widths up to four inches and in thicknesses from .003 to .25 inch.

Typical applications for the strips include the joining of large areas in pumps, valves and engine parts, making pressure-tight joints in high pressure pipe lines, and blind joints in cooler and condenser parts.

More information? Circle Item 13 on postcard, page 119

New Line of Automatic P.R.Vs.

A new series of automatic pressure reducing and regulating valves is placed on the market by A. W. Cash Valve Mfg. Corp., Decatur, Ill. Known as Cash-Acme's Type BBC, the series is intended primarily for use on Bunker C oil service, as well as other dirty liquids or fluids with a high viscosity. All sizes are of the direct acting, single seated, spring loaded diaphragm type pressure reducing and regulating valve, which automatically reduces a high pressure to a lower pressure and maintains that lower pressure at a constant.



The valves are fully self-contained, with simple pressure adjustments. The inner valve and valve seat are both renewable, both of high grade stainless steel. There are no small ports or passages to foul up this new regulator and cause it to become inoperative under almost any set of operating conditions.

Owing to the new design incorporated in the contour of the piston seat, which is substantially a universal joint arrangement, this valve will still close off well under practically all operating conditions.

Another feature is the accessibility of working parts for cleaning or inexpensive replacement after long use. To clean or replace parts, all that is necessary is removal of the bottom plug, with the valve still in line.

The valves are available with a standard square head adjusting screw, handwheel, or T handle if desired.

More information? Circle Item 14 on postcard, page 119

Half-Round Unit Coolers

Modern design, ease of accessibility and protection in case of motor failure, are major features of a new line of TW unit coolers announced by Tenney Engineering, Inc., Newark, N. J.

Semi-circular design allows for maximum distribution of air to the space to be cooled. Removal of one thumb screw opens the entire unit for servicing. Fans, motors, valve connections and components are located for unobstructed servicing without disturbing refrigeration, electrical or drain lines. Twin fans and motors give extra safety; one fan and motor maintains safe refrigerator temperature in case the other fails.

Construction features include tin-plated copper tubing, faceted-surface aluminum fins for greater heat transfer, integral heat exchangers, hammer tone exterior finish, slotted hangers for ease of installation, and removable drain pan and trough pitched toward drain connection and insulated to facilitate draining and eliminate sweating

The cooler is available in four different models having capacities from 3750 to 12,900 Btu per hour.

More information? Circle Item 15 on postcard, page 119

Heat Pumps in 3 or 5 Hp

The type HP heat pump is announced by Westinghouse Electric Corp., Air Conditioning Div., Boston, Mass. It provides heat in the winter, cooling and dehumidification in the summer, and ventilation, circulation, and continuous cleaning of the air.

The all-electric unit depends solely on air for its exchange medium. In summer it draws heat from inside air and discharges it to the outside. In winter the heat pump reverses itself, draws heat from outside air, and delivers it to the inside.

Completely automatic operation of the reversing cycle is made possible by the development of a simplified transfer valve for refrigerant flow control. This device when connected with a wall thermostat automatically switches the unit from heating to cooling, and vice versa.

Through the use of a specially designed metering tube the need for expansion valves and check valves is eliminated.

Air ducts can return either under the floor at the bottom of the unit or through the side. The outside air connection is normally stubbed directly through an outside wall. The heat pump is designed for installation with its back next to a wall and in one corner if necessary. Access is required only to the front for service adjustments to all components.

It is available in two sizes, a 3 hp model costing approximately $2300 installed and having a nominal heating and cooling capacity of over 30,000 Btu per hr, and a 5 hp model costing approximately $3300 installed and having a nominal capacity of over 50,000 Btu per hr.

More information? Circle Item 16 on postcard, page 119

Isolating Fan, Compressor Bases

Vibration isolating bases for large fans and compressors are available from The Barry Corp., Watertown, Mass. Use of these mounting bases, designed and built to individual performance requirements, are said to overcome the disturbed and often destructive effects of vibration transmitted to floors and walls from this equipment. Photograph shows a typical mounting system.

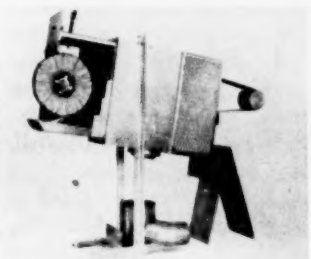
Unit mountings designed to carry the weight and match the vibration characteristics of the installation are held between steel members that run the full length of the machine. A motor mounting plate is incorporated in one member to keep the motor and fan pulleys the same distance apart at all times for steady drive and reduced belt wear.

Bulletin is available.

More information? Circle Item 17 on postcard, page 119

Self-Filtering Buffing Hood

A new-type self-filtering hood, engineered for buffing and polishing wheels and belts, is introduced by Slonneger Products Co., Dayton, Ohio. Dust is withdrawn and controlled by the air motion created by the revolving buffing or polishing wheel or belt.



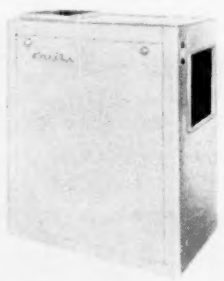
Known as the Elim-O-Dust, the hood is designed to remove minute amounts of dust and dirt down to 0.02 micron in size. It is claimed to save up to $300 in heat, power, maintenance and space costs in a ten-year period. Snagged parts are deflected by the air foils preventing serious injury to operators. The danger of dust-laden exhaust ducts is also eliminated by the unit. Filters facilitate the capture of valuable metals which are thus reclaimed and used again.

The universal hood can be adjusted to any height spindle and to any angle. It is designed to accommodate straight back or floor level back stands for polishing belts. The standard hood will accommodate wheels up to 18 inches in diameter and 9 inches wide; hoods may also be designed according to individual specifications.

More information? Circle Item 18 on postcard, page 119

Basic Cooling, Heating Unit

A single, basic air conditioning unit which may be used for a wide range of home and commercial installations, is placed on the market by Refrigeration Div., Curtis Mfg. Co., St. Louis, Mo.



The new basic cooling unit can be used for all types of remote, duct-type cooling. It is easily attached to any modern home heating plant, or it can be fitted with steam or hot water coils for all year air conditioning. When a combination air conditioner and furnace is required, a specially designed AGA-approved gas heating unit fits on top of the basic unit. For commercial or business installations where package-type, free-throw cooling is desired, a special plenum is available to set onto the basic unit. Here, too, steam or hot water coils may be installed for year round heating and cooling.

The compact size of the unit, requiring only 7 sq ft of floor space, makes it suitable for closet, utility room or basement installations.

Bulletin RS10E-17 is available.

More information? Circle Item 19 on postcard, page 119

Insulator for Hot Buried Pipes

A new product for insulating and protecting hot underground pipes from corrosion is announced by American Gilsonite Co., Salt Lake City, Utah, jointly owned by Barber Oil Corporation and Standard Oil Company of California.

The new product, Gilsulate, provides protection against such corrosive factors as alkaline ground waters, electrolysis, root attacks, and bacterial action, is easy and cheap to install, and is a fine insulator.

The product is a blend of sized and selected Gilsonite, a solidified petroleum found only in Utah. When poured around a hot underground pipe, a layer of the material melts and is fused to the pipe. Outside this first layer or zone, there is a zone of sintered particles, and finally there is a third zone of unconsolidated material.

The first two zones are completely waterproof. Zone one, bounded tightly to the pipe, is a dense, semi-plastic coating which permits the pipe to expand and contract and acts as an excellent thermal and electrical insulator. Zone two provides excellent thermal insulation under wet or dry conditions. The unconsolidated zone three provides excellent thermal insulation and a high load carrying capacity.

The product is simple and easy to install, without use of skilled labor. As for any insulation, a shallow trench is required with pipe supports at regular intervals. The material is poured around the pipes to the required depth, the surface of the insulation is tamped and the trench backfilled. Then hot steam or other fluid is run through the pipes and the job is insulated.

Where required, repairs or changes to the pipe line can be made quickly and easily by simply removing the backfill and chipping off the insulation. The new product is not subject to deterioration or corrosion in the ground. Tests show that heat loss from a pipe insulated with this material is 8 to 11% of the loss from bare buried pipes.

The new product is supplied in three grades to meet the needs of most hot underground lines. Type A is effective over a temperature range from 220 to 310 deg. F; Type B, from 300 to 385 deg.; and Type C, from 385 to 520 deg. The three grades have a different initial melting point at which the plastic zone is formed.

More information? Circle Item 20 on postcard, page 119

Casting Repair Plugs

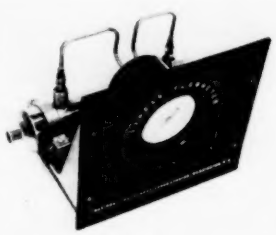
A line of casting repair plugs is available from U. S. Plug & Fitting Co., Wellington, Ohio. They are available in sizes from $\frac{1}{16}$ inch to $\frac{1}{2}$ inch in either tapered pipe thread or 27 threads.

The purpose of the plugs is to provide an economical method of repairing and salvaging cast iron castings that would otherwise be unfit for use. Three styles, as shown in the illustration, are available.

More information? Circle Item 21 on postcard, page 119

Dial Type Flowmeter

The Model 30 Vol-O-Flo, a dial indicating gas flowmeter, is introduced by National Instrument Laboratories, Inc., Riverdale, Md. It consists of a differential pressure gage across a linear pressure drop flow element. It was designed for measuring the rate of flow of gases at pressures up to 20 psig. For vacuum service, it is operable to absolute pressures as low as $\frac{1}{2}$ psia.



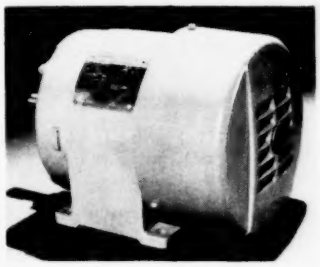
Special attention has been given to designing for semi-remote applications in which the indicator is used several feet distant from the flow element. Neither the flow element nor the indicator require levelling. Use of a mechanical differential pressure gage makes it possible to operate the flowmeter over the temperature range from −60F to + 180F. Full scale flow ranges are available from 0.003 to 30 cfm for most gases.

More information? Circle Item 22 on postcard, page 119

Sharply Improved Motors

A new line of polyphase a-c motors, offering better protection, more efficiency, and quieter operation is announced by General Electric Co., Small Integral and Medium Induction Motor Departments, Schenectady, N. Y.

Called Tri-Clad 55, the new motors are the result of more than 250,000 man-hours of developmental engineering and research. Built to latest standard NEMA frame dimensions, they feature entirely new and advanced concepts of motor design.



With an average size reduction of 50% by volume and averaging 22% less weight per horsepower, the motor retains cast-iron construction and incorporates a new insulation system, bearing assembly, and ventilation plan.

The keystone of the insulation system is a new polyester film which is eight times as strong as previously used materials. It is used to insulate the phases and slot tubes in the stator—the points of hardest motor wear.

The new bearing assembly is more tightly sealed and is lubricated by a grease which lasts at least five times longer than formerly used lubricants. A double-end ventilation system uniformly cools the motor by drawing air in from beneath both endshields, through carefully baffled air passages, and out louvers on the sides of the frame. Larger integrally-cast rotor fans increase the cooling air flow through the motor and dissipate rotor heat more effectively.

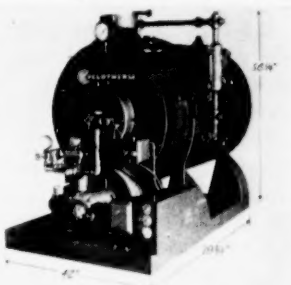
A major part of the new motor design involves noise levels. The noise level of the new 10-hp motor tests as low as the former 2-hp model. All new motors must now pass a quality control sound test before leaving the factory.

After the first of the year, the new motors will be available in the 182 and 184 frame sizes (1, 1½, and 2 hp at 1800 rpm) in horizontal drip-proof and totally-enclosed fan-cooled models, and a complete line of gear-motors. Larger frame sizes will become available at regular intervals.

More information? Circle Item 23 on postcard, page 119

50 Hp Firetube Boiler

What is said to be the smallest 50 horsepower fire tube steam boiler manufactured is being delivered by Cyclotherm Div., United States Radiator Corp., Oswego, N. Y. The new unit requires less floor space and about two feet less head room than other steam generators of equal boiler horsepower, the maker reports.

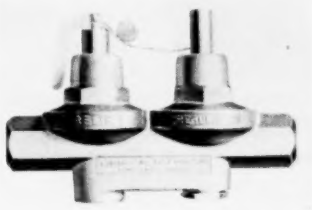


The new power package, called C1725, takes up an area of only 20 square feet, is 4 feet, 8¼ inches high. Since it requires no cement foundation or stack, it can be mounted anywhere where water, fuel and electricity are available. A simple flue vent is all that is necessary to operate at about 80% efficiency.

More information? Circle Item 24 on postcard, page 119

PRV and Relief Valve

The No. 800 Type A pressure control valve, a combination pressure reducing and relief valve for hot water systems, is introduced by Hoffman Specialty Mfg. Corp., Indianapolis, Ind. It is installed in the supply line to a hot water boiler and protects the boiler from excess pressure caused by the expansion of water within the system. At the same time, the system is automatically supplied with water at the proper pressure.



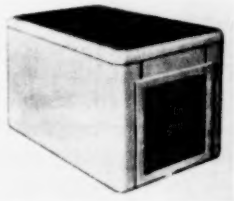
The control will maintain a pressure of 12 to 16 pounds in the boiler. In case the pressure increases to 23 pounds, the relief valve operates.

Body is all bronze with laminated phosphor bronze diaphragm. Relief valve seat is of bronze-nickle-chrome and the strainer screen is made of monel. The valve has a test or try lever for flushing and testing the system.

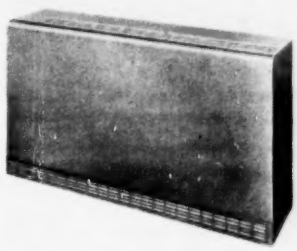
More information? Circle Item 25 on postcard, page 119

Year-Round Air Conditioners

Two new year-round air conditioners, for summer cooling and winter heating with the same unit, are announced by United States Radiator Corp., Detroit, Mich.



These units can be used for both cooling and heating. For summer cooling, a chilled water compressor is located at a remote source. For winter heating, hot water is pumped through the same pipes from a boiler located in a basement or utility room. Turning a valve permits changing from summer cooling to winter heating as the weather requires.



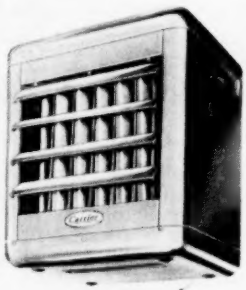
The vertical model (top view) is a free-standing unit, equipped with a floor cabinet, for non-recessed installation.

The horizontal model (bottom view) is designed for either recessed or non-recessed installation. It can be installed recessed without a cabinet, in the space over a clothes closet or in a hall. A cabinet is also available for non-recessed ceiling suspension installations.

More information? Circle Item 26 on postcard, page 119

Compact Unit Gas Heater

Development of a new, compact, gas-fired unit heater, designed to meet the increasing demand for equipment combining maximum capacity with limited installation space requirements, is announced by Carrier Corp., Syracuse, N. Y.



The new unit is 23 inches high, less than 23 inches deep, including fan and motor assembly, and only 19½ inches wide, with a capacity of 50,000 Btu per hour. It is particularly suitable for those spaces where headroom is at a premium.

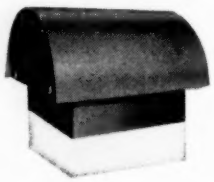
Gas is fired directly in the tubes of an all-welded heat exchanger of sturdy, one-piece, gas-tight construction. The heat exchanger is made of 16 gage corrosion-resistant aluminized steel. The special composition of the exchanger is molten aluminum permanently bonded to both sides of low carbon steel by a patented process.

Enclosed in a gray baked enamel casing, the new heater is approved by AGA for use with all types of gas.

More information? Circle Item 27 on postcard, page 119

Power Roof Ventilators

A new line of propeller fan type Massachusetts power roof ventilators is announced by The Bishop & Babcock Mfg. Co., Cleveland, Ohio.



Featured in these units is the steel venturi type inlet orifice propeller fan. Motors are totally enclosed, heavy duty, ball bearing grease lubricated, 55 deg C rise, NEMA.

Standard finish on outer exposed sections is prime galvanized steel coated with rust resisting enamel. Stainless steel, copper or other materials are available on special order.

Bulletin 119 is available.

More information? Circle Item 28 on postcard, page 119

Filter Media in Pads

Hospital-white Amer-glas resilient glass fiber filtering media is available in unframed pads cut to size or in rolls, according to the maker, American Air Filter Co., Inc., Louisville, Ky. Consequently, there is no longer need for manufacturers to design their equipment around a standard size air filter.

This filtering media can be bent, squeezed or shaped to any form without losing its filtering efficiency. Thus, it can save space inside the unit. And, because its filtering surface extends all the way out to and including the edge, the filtering media offers maximum filtering surface and holds leakage to a minimum.

The resiliency of the media helps hold it in place without pad retainers or other devices. Because it is made from continuously interlaced glass filaments, it cannot pull apart easily.

An informative brochure is available.

More information? Circle Item 29 on postcard, page 119

Insulating Seal for Baseboards

Alfol Asbestos 103, a reflective-type insulation specifically developed for heating use, is announced by Reflectal Corp., New York, N. Y.

It consists of pure aluminum foil bonded by a heat-resistant adhesive, to asbestos paper. Unlike asphalt, this adhesive will not soften or bubble under heat, will not run, form odors or permit the foil to peel.

Thermally, the insulation is the equal of nearly two inches of plain aircell asbestos. It is packaged in convenient rolls of 100 lineal feet, and in seven stock widths: 6, 9, 10, 12, 18, 24 and 36 inches.

More information? Circle Item 30 on postcard, page 119

Spray Type Feedwater Heater

A new spray type deaerating feed water heater that operates silently and requires a minimum of cleaning and maintenance has been developed by Stickle Steam Specialties Co., Indianapolis, Ind.

The unit has no loose parts, baffles or trays. Only part that requires cleaning is the spray distributor which is easily removed without breaking any piping connections.

The heater is designed for use by power plants operating with a boiler pressure of 75 psi or more. Capacities in the various models range from 3,000 to 300,000 lbs. of preheated feed water per hour. Any desired storage capacity may be incorporated.

Main feature of the heater is a series of four permanently installed semicircular baffles which slope downward to the straight edge. Edges are upturned and serrated, project slightly past the heater center line.

Raw feed water is sprayed onto the upper baffle. As it cascades over the serrated edges in a series of thin streams, it comes in direct contact with the rising steam. Air and noncondensable gases are swept upward to the vent condenser where steam is condensed to form feed water, and corrosive gases are vented.

More information? Circle Item 31 on postcard, page 119

(*Continued on page* 104)

BRADFORD VENEER & PANEL CO., INC.
Bradford, Vermont

Architects—E. H. and M. K. Hunter, in Hanover, N. H.

Another case of

COPPER

where it counts!

Winters get mighty cold in Bradford, Vermont. So if you want to keep "comfy" you've got to have an adequate and reliable heating system. That's why, when the Bradford Veneer & Panel Co., Inc., built their plywood mill office they used radiant panel heating. And reliability was also the reason they chose Revere Copper Water Tube for their radiant heating system.

The radiant floor panel system is a one-zone affair with a converter, so that steam from the main factory can be used. There were 1,120 feet of Revere Copper Water Tube used in sizes of 1"—1¼"—1½" and 2".

Keep out of trouble with copper. Use Revere Copper Water Tube for radiant panel heating, hot and cold water lines, underground service lines, air conditioning and processing lines, waste stack and vent lines. See the Revere Distributor nearest you today. And, if you have technical problems, he will put you in touch with Revere's Technical Advisory Service.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.— Sales Offices in Principal Cities, Distributors Everywhere.

SEE "MEET THE PRESS" ON NBC TELEVISION, SUNDAYS

WHY REVERE COPPER WATER TUBE IS PREFERRED BY—

Architects, Builders, Plumbing & Heating Contractors

EASY TO BEND

Saves Time

Revere Copper Water Tube is easy to bend. Soft temper can be bent by hand to meet installation conditions.

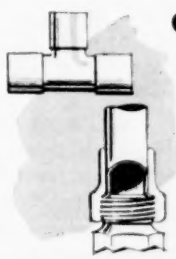
HANDY LENGTHS

Save Fittings . . . Labor

Revere Copper Water Tube comes in straight lengths of 20' in hard and soft tempers. 60' coils of soft temper reduce the number of fittings needed.

SOLDER OR COMPRESSION FITTINGS

Need Less Work Room . . . Save Metal



No worry about wrench room when you use Revere Copper Water Tube with solder fittings. Compression fittings can also be used. No threading is necessary with either type fitting. Wall thickness of tube used can thus be less than for threaded pipe.

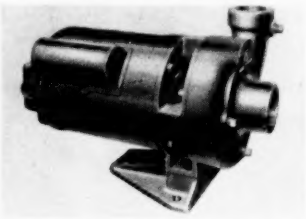
NON-RUSTING

Rustable pipe eventually clogs as shown in drawing at top right. Non-rustable Revere Copper Water Tube suffers no loss of flow or pressure as shown at bottom right. No allowance in pipe size need be made for rust accumulation with Revere Copper Water Tube.

(*Continued from page* 102)

Pumps for Cooling Systems

Two new centrifugal pumps are in production by The Duro Co., Dayton, Ohio. The pumps, 1 and 1½ hp, are designed primarily to provide high capacity at low cost. Both units are applicable for air conditioning.



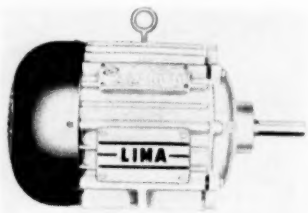
Basic use of these new units will be in booster service for cooling systems, lawn sprinkling, hot and cold water circulation, and residential type swimming pools.

Both units feature NEMA standard capacitor type motor, 3450 rpm, 115/230 volt with overload protection. Pump shaft is corrosion-resistant stainless steel. Design is compact and close coupled. Rotary type seal, self-adjusting, requiring no lubrication and leakproof. Iron pump case can be rotated to accommodate installation of discharge pipe at various positions. Unit has two piece bronze balanced impeller. The 1 hp model is illustrated.

More information? Circle Item 32 on postcard, page 119

New Fan Cooled Motors

A new design of totally enclosed, fan-cooled motor is being made by Lima Electric Motor Co., Lima, Ohio. the new Type E is available in ratings of ¾ hp at 900 rpm to 20 hp at 3600 rpm in frame sizes 224 to 326 inclusive.



Features include: Rigid, seasoned cast iron frames with integral feet, deep, integrally cast fins providing extra heat dissipating surface resulting in cooler operation, double-width prelubricated sealed ball bearings require no greasing or cleaning for normal life; correct quantity of lubricant is sealed in and dirt and moisture is sealed out.

A cast aluminum fan provides high velocity air over the cooling fins. This rapid movement of air does not permit dust, dirt or other foreign matter to accumulate on the motor frame. The motor actually blows itself clean continuously. These motors can be supplied for vertical, wall or ceiling mounting, as well as standard horizontal floor mounting.

A brochure is available.

More information? Circle Item 33 on postcard, page 119

Electronic Water Sterilizer

Chlorination, heating and cooling, and tank storage, the costly operations in water sterilization, are eliminated in an electronic water sterilizer available from Aquafine Co., Los Angeles, Calif. Capable of handling quantities up to 7,000 gph, this simple and compact sterilizer has no moving parts, weighs only 95 pounds, and operates on 110-volts, 60-cycle a.c.

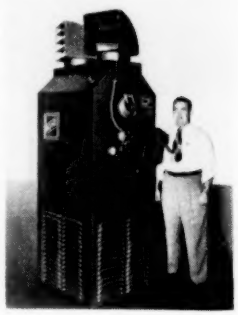
The sterilizer operates simply by guiding water by helical baffles into contact with a number of Westinghouse Sterilamps, which emit germ-killing ultraviolet rays. The lamps have a 6,000-hour life and the stainless steel sterilizer is designed for ease of maintenance and lamp replacement.

The sterilizer will find application in most industries and will be particularly applicable to those industries which use large quantities of sterilized water such as the dairy, brewing, bottling, and pharmaceutical industries.

More information? Circle Item 34 on postcard, page 119

200,000 Btu Space Heater

Addition of a new light oil fired warm-air heater to its line of space heating units is announced by Heating Dep., Machinery Div., Dravo Corp., Pittsburgh, Pa. Known as the Paraflo space heater, this new unit is manufactured in two models, the Model 20 with 200,000 Btu per hr output, and the Model 25 with 250,000 Btu per hr output. The completely automatic heater is equipped with a gun-type oil burner. It is a compact self-contained unit, completely assembled and flame tested at the factory prior to shipment.



An efficiency in excess of 80% results from the two-pass flame travel in a stainless-steel combustion chamber and passage of the hot gases through an economizer section. The stainless-steel combustion chamber gives greater and faster transfer of heat from fuel to air through elimination of expensive obstructing refractory. Use of stainless-steel also guarantees longer heater life and sustained efficiency.

Another feature important to heater life is the floating method of mounting the combustion chamber. Supporting straps hold the chamber in position regardless of whether the heater is mounted vertically or horizontally, yet one end is free to move as the metal expands and contracts. Permitting one end to float freely relieves strains and stresses, and prevents buckling from expansion and contraction of the metal. The complete absence of refractory permits mounting the heater either vertically, horizontally or suspending it overhead.

The air circulating fan takes in air at floor level, directs it around the combustion chamber, through the economizer section and out through two 12 × 12 inch directional nozzles. The nozzles can be rotated 360 degrees thereby directing warm heated air to any desired location. The high velocity overhead discharge air will warm areas up to 90 feet from the unit without creating uncomfortable drafts. The unit is also suitable for connecting into duct systems.

The heater operates on 110 volt, 60 cycle, single phase power, and burns up to and including No. 2 fuel oil.

More information? Circle Item 35 on postcard, page 119

Multi-Stage Deep Well Pump

A multi-stage jet pump, Fig. 3371, especially designed for deeper well installations up to 200 ft, where higher pressures are required, is announced by Goulds Pumps, Inc., Seneca Falls, N. Y. Built in 2-stage and 3-stage models, the pump is available in ¾, 1 and 1-½ hp units, with capacities ranging up to 1175 gph. The new system may be used for twin pipe installations in 3, 4 and 4½ inch diameter well casings, as well as for single pipe installations in 2, 2½ and 3 inch well casings. The motor, a 3500 rpm capacitor type, and the entire rotating element are easily dismantled for inspection without disturbing pipe connections.

The new pump is one of two new additions to the company's line. The other pump, designated as Model 3658, is a low-cost deep well water system for well depths up to 130 ft.

More information? Circle Item 36 on postcard, page 119

Precision Tantalum Strip

Tantalum strip, precision-rolled to close tolerances and to thin gauges and foils, for use in the manufacture of refrigerating, air conditioning, heating and plumbing equipment, is available from Industrial Div., American Silver Co., Inc., Flushing, N. Y.

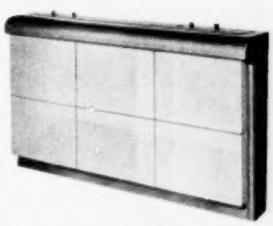
Tantalum, an extremely non-magnetic and corrosion resistant metal, with tensile properties comparable to cold-rolled steel, is custom rolled by this company in strip up to 6 inches wide and down to .0005 inch, to tolerances as close as one ten thousandth inch, plus or minus. The strip is available in any quantity.

Typical uses for tantalum strip include: heat exchangers, coolers, condensers; thermometer wells; acid proof equipment; electronic controls; signal and alarm systems and timing devices.

More information? Circle Item 37 on postcard, page 119

Three Air Conditioning Units

Three air conditioners have been announced by Brown Products Co., Forest Hills, N. Y. They use cool water for summer cooling and hot water for winter heating. The units have large filters and two speed blowers. The relatively low pressure drop through the units permits installation without expensive pumps and extra piping.



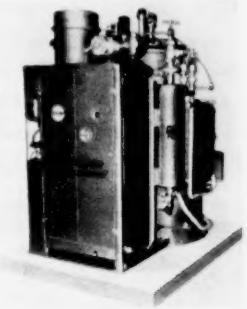
The water chiller is assembled in an attractive jacket for location in basement or boiler room, the conditioning units being remotely located. The chiller is available with air cooled condenser. For basement installations it is supplied with condensate booster, where condensate collected from room units is used to provide additional evaporative cooling. The unit is factory assembled and requires only simple piping and electrical connections.

The conditioning units are made in three sizes, ⅝, 1 and 1½ tons.

More information? Circle Item 38 on postcard, page 119

Oil-Gas Steam Generator

The Model OKJ-4740 steam generator that can change from fuel-oil to natural gas fuel by flipping one switch and without interrupting steam output, is introduced by Vapor Heating Corp., Chicago, Ill.



The fuel-oil spray nozzle is incorporated into the metal body of the gas burner. When the fuel selection switch is flipped from natural gas to oil, the motorized gas valve closes and the fuel-oil solenoid valve opens, releasing oil under pressure to the spray nozzle. Fuel oil is always ready to be released to the combustion chamber because it is continuously circulated through the steam generator's hydraulic modulating controls. A constant spark and pilot light insure positive lighting.

It develops full working steam pressure up to 300 lb pressure, in less than three minutes from cold water, and makes 1500 to 5000 lb of steam per hour.

Once started, by turning one switch, automatic controls take over causing the steam generator to turn on and off and modulate steam output to meet a changing steam demand. The steam pressure may be changed from 10 to 300 lb pressure by turning one control.

The generator is a complete package which includes the 7½ hp electric motor, blower, feed water pump, steam separator, steel coils, and all the controls, in a trim cabinet. Overall dimensions are 50 inches wide, 80 inches high, and 73 inches long.

More information? Circle Item 39 on postcard, page 119

Portable Gas Space Heaters

Several new models have been added to its line of Sonic-Ray portable space heaters by The Bica Co., Girard, Ohio. The new models are the Model T, Model W and three AGA-approved space heaters.

The Model T is rated at 35,000 Btu per hour and is thermostatically controlled. It is designed for safe, unattended operation, including a self contained thermostat for maintaining a pre-determined room temperature.

The Model W is a portable, combination water and space heater. It is rated at 85,000 Btu per hour input with a capacity of 100 gallons per hour at 125 degrees F.

Models AD, AF and AT are rated at 50,000 Btu per hour input and may be used for permanent or semi-permanent installation.

More information? Circle Item 40 on postcard, page 119

(*Continued on page* 108)

How Honeywell Customized

Temperature Control can help you

Give your clients a better indoor climate

Why Customized Temperature Control is becoming a must for all types of buildings

Just as you often have to guide client thinking when it comes to the sort of building he really needs, today it's also important to make sure he gets proper temperature control.

Many advances have been made in temperature control which may be news to your client.

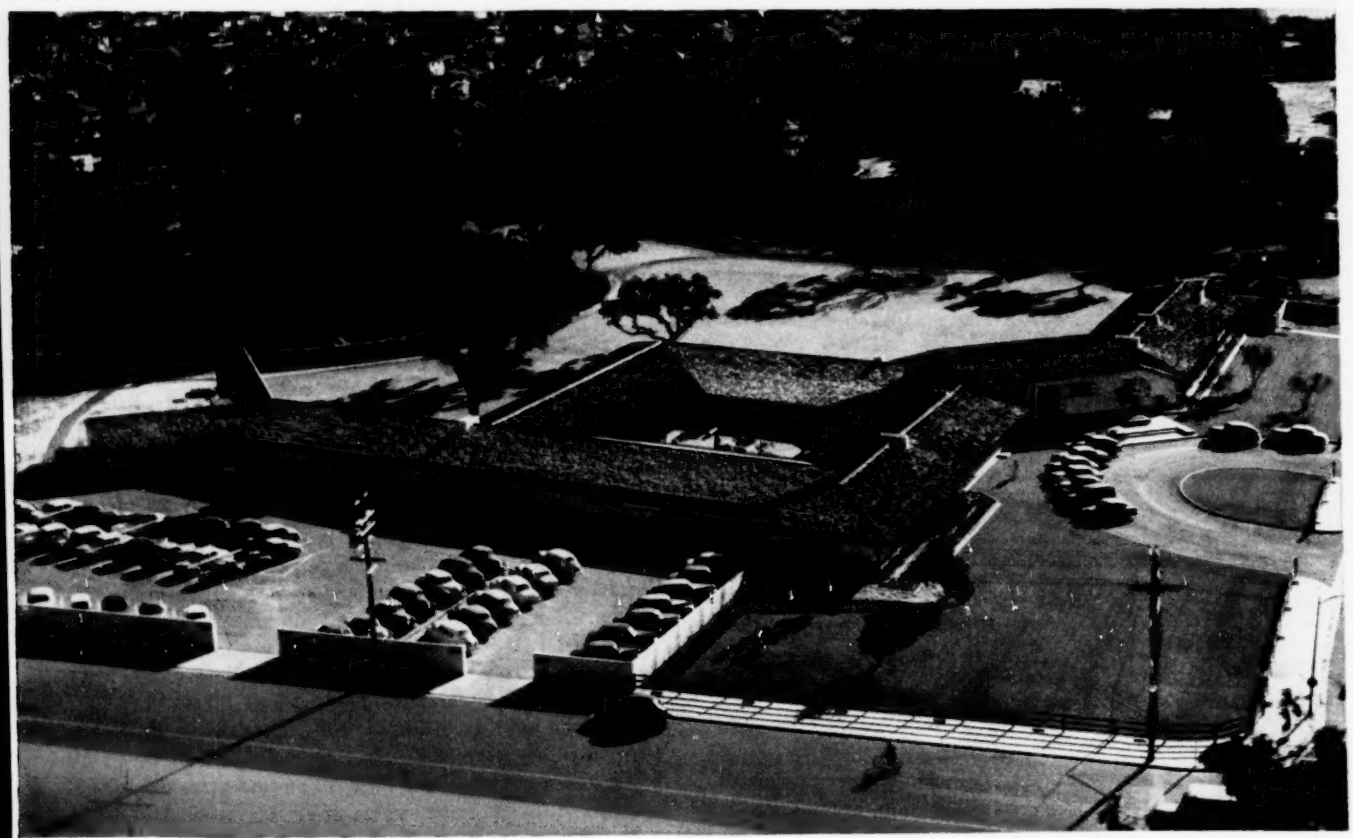
Such an advance is Honeywell Customized Temperature Control.

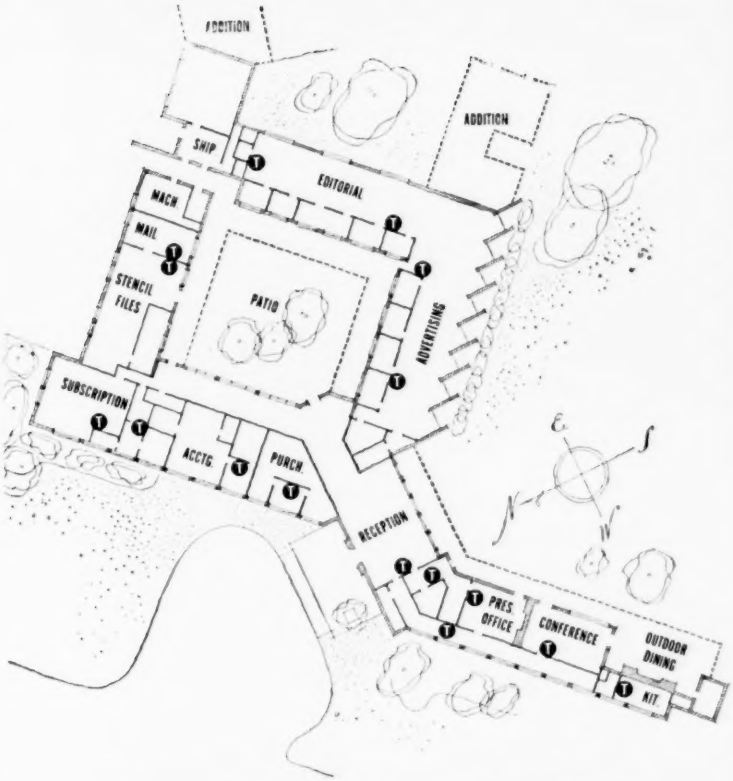
The key word here is "customized." It means that whatever your clients' control requirements, a Honeywell Customized Temperature Control installation *designed to fit the needs of the building* is your answer. This applies to heating and cooling, ventilation and humidity control, as well as industrial control.

Only Honeywell can provide true "customized" control. Because only Honeywell manufactures all three types of controls – pneumatic, electric and electronic – which often must be integrated in a single building to give you the right performance.

The story, in brief form, of how Honeywell Customized Temperature Control was used to solve specific occupancy, use and exposure problems in Sunset Magazine's "dream home" in Menlo Park, California, is told by the floor plan and the pictures and captions at right.

Sunset Magazine's Publishing Office as seen from the air. Architects: Higgins and Root, San Jose. Design consultant: Cliff May, Los Angeles. Heating contractor: Schlegel Plumbing Contractors, Inc., Menlo Park, California.





For comfortable, even temperature in new or existing buildings – of any size – use Honeywell Customized Temperature Control

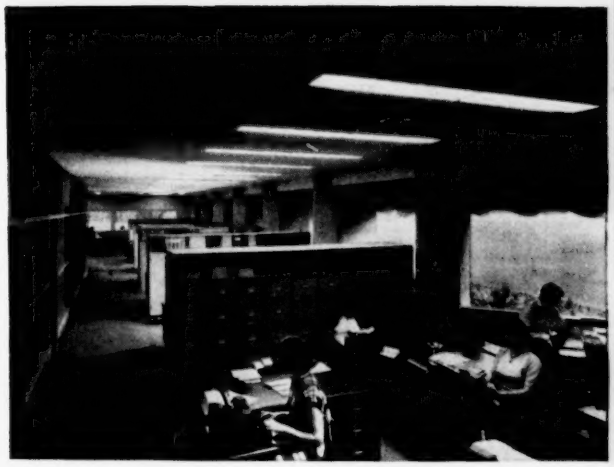
Whether it's an office, motel, airport, hospital, apartment, church, school, factory, store, garage – or any size building – new or existing, Honeywell Customized Temperature Control can help meet your clients' heating, ventilating, air conditioning and industrial control problems.

They'll not only enjoy more comfort and efficiency, they'll save fuel, too.

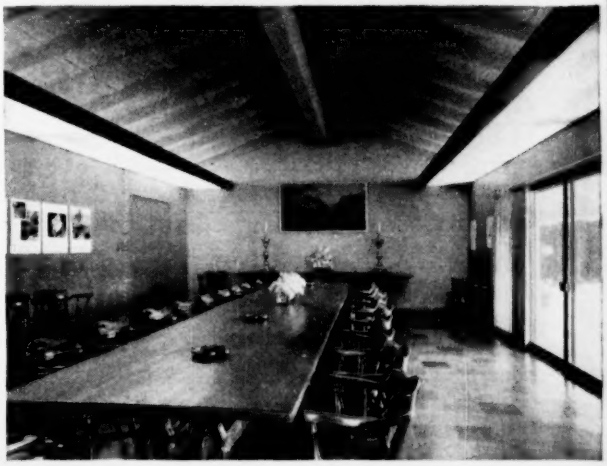
For full facts on Honeywell Customized Temperature Control, call your local Honeywell office. There are 104 Honeywell offices across the nation. Or mail the coupon today.

L. W. Lane, publisher of "Sunset" says,

"What we wanted was a place where workers confined by four walls could still enjoy the feeling of outdoor living. By providing us with near-perfect indoor climate, Honeywell Customized Temperature Control has contributed much to that enjoyment."



Honeywell Thermostats are giving new meaning to comfort in the headquarters of Sunset Magazine. The view above, including the editorial and advertising offices was taken from the northwest. Two thermostats are needed in this area to compensate for strong southern and western sun.



The thermostat installed in the conference room above, compensates handily for chill that sometimes comes from the large window area, keeps the temperature just right if a conference includes five persons – or twenty-five.

MINNEAPOLIS
Honeywell

First in Controls

MINNEAPOLIS-HONEYWELL REGULATOR COMPANY
Dept. HV-11-218, Minneapolis 8, Minnesota
Gentlemen: I'm interested in learning more about Honeywell Customized Temperature Control.

Name _____

Firm Name _____

Address _____

City _____ *Zone* ____ *State* _____

(*Continued from page* 105)

Line of Gas Unit Heaters

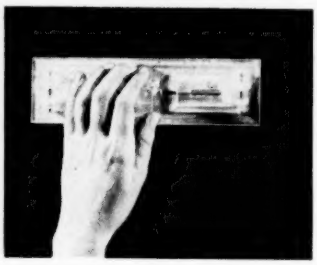
A new line of gas-fired unit heaters for automatic, direct-fired heating of industrial and commercial areas is announced by Grinnell Company, Inc., Providence, R. I. The eight-model line is made in capacities from 20,000 to 160,000 Btu per hour.

These heaters can be used with natural, manufactured, mixed or LP gases and are equipped with motor-driven fans ranging from 1-40 to 1-6 hp, depending upon the capacity of the unit. The fans operate at relatively low speed and have wide efficient blades for maximum air movement with minimum noise. Louvers are individually adjustable. Safety against escaping gas is provided by an automatic safety pilot which operates to shut off the gas supply if the pilot burner goes out. The heaters are manufactured in compliance with the safety requirements of the American Gas Association and bear its approval seal.

More information? Circle Item 41 on postcard, page 119

Compact Drawing Instrument

A new instrument for drawing, the Glide-Rule, is introduced by Smith Drake Corp., Inglewood, Calif. This transparent instrument capable of rolling in two directions, combines important engineer's tools in one—triangles, T-squares, straight edge, scales, protractor and parallel rules.



For precision drawing in the field, the instrument is easily carried in the pocket; its size is $2\frac{1}{2} \times 9$ inches. The instrument has the advantage of accurate engraved scales and protractor; four drawing edges with scales in 16ths and 20ths; the protractor is a full 180°, with emphasized 30, 45, and 60° angles.

The operation of the device leaves one hand free for drawing. The instrument rolls both up and down and right and left. A small thumb button permits the user to change direction and roll the instrument quickly and easily to the desired position.

Price is $3.95 each.

More information? Circle Item 42 on postcard, page 119

Molecular Vacuum Gage

A new molecular vacuum gage, designed to measure pressures without external detectors, is announced by General Electric Co., Schenectady, N. Y.

The instrument is available in two types, both covering the range of 0-20 millimeters of dry air. Identical except for scale marking, one is calibrated directly for dry air and the other has a linear scale for use where individual calibration for dry air or other gases is preferred.

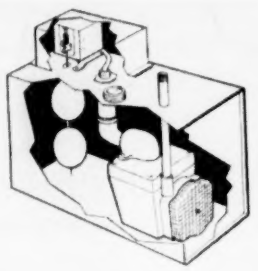
Two types of scale markings are used since it is preferable to have a direct reading gage when used with dry air. Users might prefer the arbitrary scale for applying their own calibration. Lighter gas (hydrogen) will have a higher full scale pressure limit, while heavier gases (xenon) will have a lower full scale pressure, they said.

It is expected that the new gage will be useful in applications involving vacuum metallurgy and purification and refrigeration unit manufacturing.

More information? Circle Item 43 on postcard, page 119

Line of Condensate Pumps

A new series of pumps called Little Giant, is announced by Samuel S. Gelber Co., Chicago, Ill. These pumps, while small in size, are capable of high capacity performance in the removal of condensate in air conditioning units and refrigerated cooling systems as well as in small sump installations.



The pump is made of die-cast aluminum, treated and covered with baked plastic coating to prevent corrosion. It is hermetically sealed in 5 years' supply of oil and requires no further oiling. The pump is electrically grounded and is furnished with a 6 foot cord to provide 110 volt 60 cycle A.C. current only. The pump presents a pleasing external appearance lending itself well to installations where space limitations require the unit to be put outside the air conditioning.

It is offered in three sizes with capacities to 7 gpm with discharge heads to $17\frac{1}{2}$ feet. It is equipped with a special Penn positive displacement switch and is completely automatic in operation.

More information? Circle Item 44 on postcard, page 119

Vaneaxial Blower for 350°

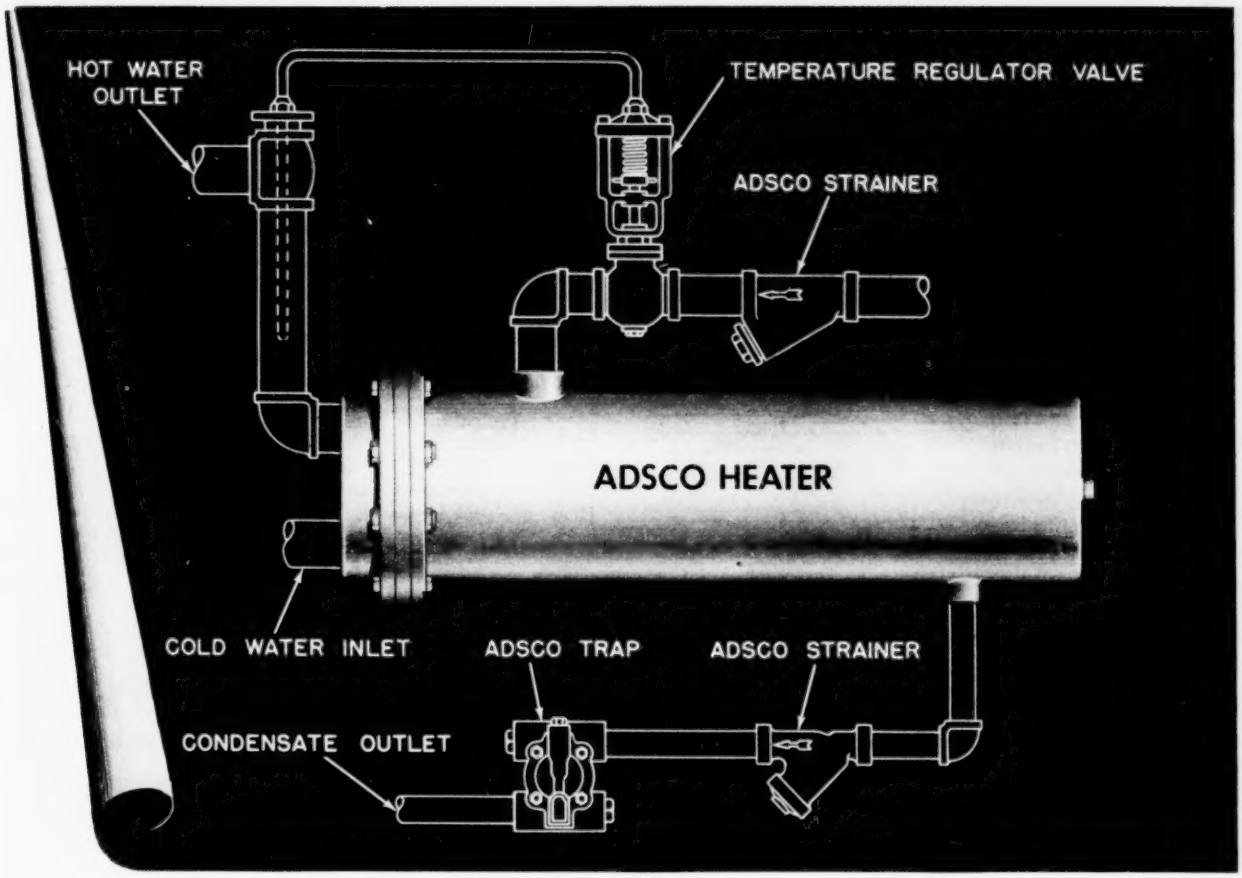
A vaneaxial blower which may be used to move air at temperatures up to 350 deg. or air containing acids, alkalies or fine abrasive dust without fear of premature failure of belts and bearings, is developed by Hartzell Propeller Fan Co., Piqua, Ohio. It is available in 12 to 54 inch sizes.

Addition of a dummy section containing the guide vanes makes possible the location of the drive on the negative pressure side of the blower. With this arrangement, clean air from outside the duct is drawn in through the belt tube and over the bearings.

The removal of the vulnerable parts from contact with the destructive elements in the airstream insures long life and trouble-free operation under adverse conditions.

More information? Circle Item 45 on postcard, page 119

(*Continued on page* 110)



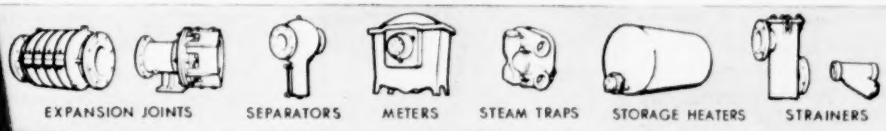
BLUEPRINT FOR ACTION!

And what action, when you use an ADSCO Water Heater! Hot water . . . when and where you want it . . . and at low cost! ADSCO Instantaneous Heaters furnish industry with general service hot water, boiler feed water, and process water. They supply hotels, apartments, office buildings, dormitories, hospitals, and institutions with hot water for showers, washrooms, dishwashers, laundries, and for general cleaning. ADSCO Convertors, a type of instantaneous heater with a shorter temperature range, furnish *all types* of buildings with hot water for quiet, trouble-free space heating systems.

Yes, you get plenty of action — fast action — out of ADSCO Water Heaters. They operate best when connected according to the typical piping arrangement shown above, with two ADSCO Y-type Strainers to protect valuable equipment and an ADSCO Dual Steam Trap to handle condensate efficiently.

ADSCO Water Heaters have only three parts: shell, tube bundle, and cover. All are made to ADSCO's high standards. Steel shells are seamless steel pipe, carefully cut and welded by skilled workmen. The shell flange is sturdy and accurately machined and all openings are precisely located. The tube bundles are made of pure, deoxidized seamless copper tubes formed into U-bends. By means of electrically and automatically controlled equipment, they are rolled and expanded into carefully drilled tube sheets which have a diamond pitch arrangement for spacing of tubes. The semi-steel covers are high-tensile, fine-grain castings.

For further information, write for Bulletin 35-78 on Instantaneous Heaters or Bulletin 35-77 on Convertors.



ADSCO ENGINEERED PRODUCTS

AMERICAN DISTRICT STEAM COMPANY, INC.

NORTH TONAWANDA, NEW YORK

Since 1877

(*Continued from page 108*)

Recirculating Water Pump

An industrial pump with scoop rotor and rubber roller-type vanes, designed for production in bronze to meet continuous water recirculation requirements, is announced by Hypro Engineering, Inc., Minneapolis, Minn.

Designated model 4300, the unit is engineered for continuous duty service through use of sealed, permanently lubricated ball bearings. An additional feature is a pressed fit of the stainless steel shaft into the inner ball bearing race to restrict lateral movement of the rotor, minimizing end thrust wear within the pump. Performance tests have indicated friction losses are held to a minimum due to the unique design.

The impeller is self-lubricated by water and will deliver approximately 7 gpm at 50 lb pressure and 1750 rpm. Pressure range is from 0 to 75 psi. The new pump is furnished with ¾-inch ports, recommended speeds to 1800 rpm. Weight is 4½ lb net.

More information? Circle Item 46 on postcard, page 119

Baseboards Simplified

Two basic design improvements in its line of baseboard radiation are announced by C. A. Dunham Co., Chicago, Ill. Both design alterations will speed and simplify installation procedures. Neither will change the exterior appearance of the installed product.

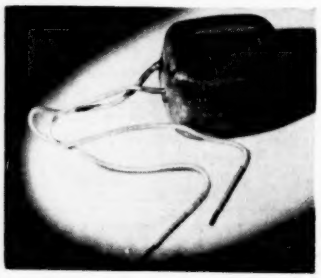
All models now feature a snap-on front enclosure designed to save installation time. This front section overlaps the back section to provide an effective air seal.

In addition, copper tube heating elements with plain ends are now available for sweat fittings. Heating elements with threaded connections are also available as in the past.

More information? Circle Item 47 on postcard, page 119

Wire for Control Equipment

Sil-X, the first UL-approved glass-braid-lacquered wire with General Electric's SE-460 silicone rubber insulation, is being produced by Essex Wire Corporation, Ft. Wayne, Ind. Wire is recommended for use in oil and gas fired furnace control equipment, and will be approved by Underwriters' Laboratories for use on devices or in appliances for temperatures up to 200 deg C where the application demands that temperature rating.



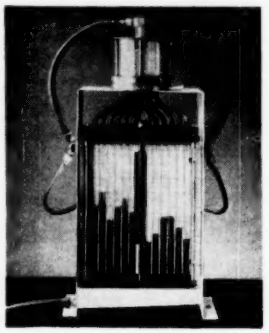
Designed to meet temperature extremes, Sil-X retains its flexibility at—60 deg F and maintains its strong physical and electrical properties as high as 400 deg.

Among other advantages are high resistance to flex cracking, low dielectric constant, and an insulation that is fungus resistant.

More information? Circle Item 48 on postcard, page 119

Fuel Oil Nozzle Test

A portable device for fast, low-cost measuring of nozzle spray dispersion in jet and diesel engines for liquid fuel burners and other mechanical atomizing equipment has been developed by Jet-Heet, Inc., Englewood, N. J.



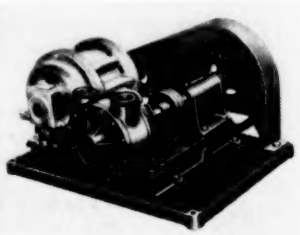
For the nozzle user the device provides immediate facilities for time and labor saving pre-installation tests to insure proper atomization. For the nozzle designer and manufacturer, it permits accurate low cost development and production tests.

Called the Patternator, the device is easily portable, weighs 25 lb, and measures 10 by 6 by 20 inches. It requires no electric current and no installation. It operates by automatically collecting and measuring the flow in each segment of the atomized spray to determine the dispersion pattern as well as the total flow. It is adaptable to nozzles of varying sizes and types.

More information? Circle Item 49 on postcard, page 119

Pump for Heavy Fuel Oil

A new V-belt drive pump, designed to deliver heavy fuel oils at operating pressures up to 100 psi, is introduced by Eclipse Fuel Engineering Co., Rockford, Ill. It has been added to the line primarily to operate in conjunction with the company's CF closed flame gas-oil burners.



This Series 60 fuel oil pump is a smooth operating unit with high suction-high discharge characteristics for delivering a continuous, pulsation free stream of fuel oil to the burner. It has a gear and crescent type pumping element, which pumps equally well in either direction at 400 rpm. The unit can be used for severe continuous duty pumping of heavy fuel oil without cavitation, pounding, or churning.

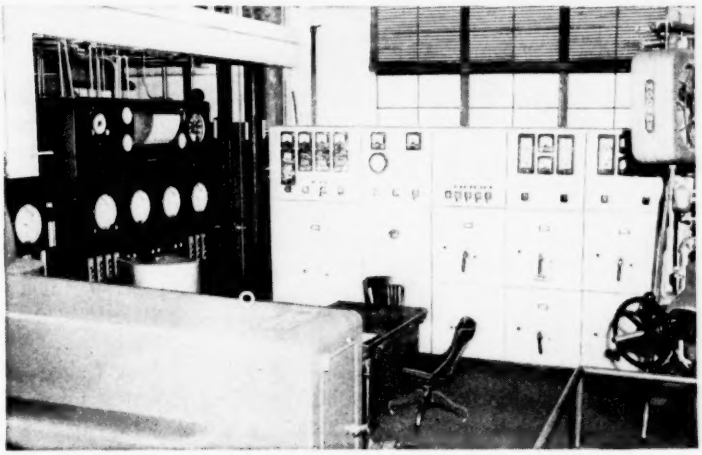
The V-belt drive is connected to the pump by a loose coupling, preventing side pull on the pump shaft. This assures longer pump life under continuous service. Belt tension is simply controlled by adjusting center distance of the motor.

More information? Circle Item 50 on postcard, page 119

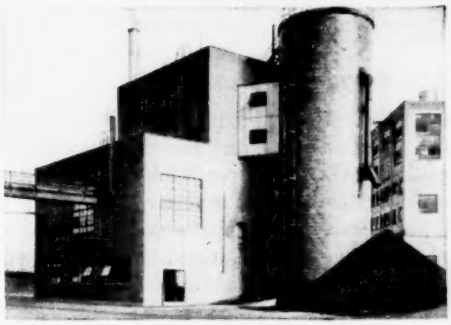
Quaker Oats
REDUCES STEAM COSTS BY
BURNING COAL THE MODERN WAY

"Our new coal installation produces steam at a cost of 32¢ per 1000 lbs. . . . reduces some operating costs about one half,"

says Walter H. Proescholdt
Asst. Chief Engineer
The Quaker Oats Company



Control center for combined boiler and turbine room operations at Quaker Oats' modern, new plant



To gain economy plus dependability, Quaker Oats Company modernized the boiler room in its paper-making plant. One efficient, coal-fired unit now supplies all steam needed for heating, processing, and power generation.

Boiler and turbine room operations combined. With automatic controls and coal- and ash-handling systems, two men per shift can operate the combination boiler and turbine generator room shown at left. Quaker Oats has found that burning coal the modern way certainly increases efficiency of operation and cuts operaing costs.

Additional case histories, showing how plants of other types have saved money by burning coal the modern way, are available upon request.

Many power plants over ten years old are as dated in efficiency as the automobiles of the same period. Ton for ton, coal burned in a modern plant can produce 10% to 40% more power. Modern coal- and ash-handling equipment can also cut labor costs substantially.

Why not let a consulting engineer look over your plant? Chances are he can point out ways of remodeling so that you can burn bituminous coal the modern way . . . and save dollars.

It pays to burn coal efficiently, because coal is not only an economical, but a dependable fuel. Coal reserves are virtually unlimited. America's coal industry is the world's most efficient and progressive. Thus you're assured of a plentiful supply of coal at relatively stable prices for generations.

If you operate a steam plant, you can't afford to ignore these facts!

BITUMINOUS COAL in most places is today's lowest-cost fuel, and coal reserves in America are adequate for *hundreds of years to come.*

COAL production in the U.S.A. is highly mechanized and by far the most efficient in the world.

COAL prices will therefore remain the most stable of all fuels.

COAL is the safest fuel to store and use.

COAL is the fuel that industry counts on more and more—for with modern combustion and handling equipment, the inherent advantages of well-prepared coal net even bigger savings.

BITUMINOUS COAL INSTITUTE
A Department of National Coal Association
Southern Building, Washington 5, D. C.

FOR HIGH EFFICIENCY FOR LOW COST

YOU CAN COUNT ON COAL!

Experience is my Classroom

By T. W. REYNOLDS

• SOLAR ENERGY

Solar power is obtained in a large way by enormous mirrors of plate glass sections on the walls of an old French fortress. One mirror, 43 by 34 ft follows the sun and deflects its rays to a fixed mirror, thence to an oven. Temperatures go up so high a slab of iron is melted in 15 seconds; 75 kw of heat power are developed. The plant is located at a sunny spot so that it can operate 250 days of each year.

In this country solar energy research will be continued by The Charles F. Kettering Foundation in its $500,000 laboratory at Yellow Springs, Ohio. It has been pointed out that the heat pump can be used for adding enough heat whenever solar heat is not sufficient in itself.

Eastern Industrial Service, Inc., Cambridge, Mass., has developed a spray on plastic film, also a sheet plastic to keep out sun heat and glare. The sheet is shatter proof and can replace glass window panes. The film is translucent, not transparent, and comes in blue, green and frost white. Weather seepage and vapor leaks are sealed. It is effective on metals, wood, concrete, brick and other construction to reflect solar heat.

Draperies, blinds and curtains can be combined in effect by substituting modern vertical paneled draperies that are dust repelling and easy to clean. They are also used for French doors and partitions.

• NEW PLUMBING DEVICES

The toilet is a useful but sometimes troublesome device which seems to intrigue many an inventor. There is the luminous seat, the automatic bowl cleaner to work with each flush, the tank with rim or guard to hold articles and even the sewerless toilet.

Much more thought seems to have been given to eliminate sweating of the toilet tank. And so there are, provided electric immersion heaters, hot water mixing valves, a plastic tank cover with a dead air space and now there is a small unit which automatically meters hot water supply to the tank each time the toilet is flushed. This device maintains a more constant temperature across the tank at each flushing. It may be installed in some out of the way place and obtained from Dudgeon Distributing Co., Omaha, Neb.

The baby and young children need a toilet seat adapted to their small size, one that can be easily set in place and as easily removed. One such seat is made by Waukegan Baby Seat Co., Waukegan, Ill. Another new device is to prevent the continuously running water closet with consequent noise and water waste. This device is a rubber tank ball with a plastic propeller which spins to close the valve seat as the water flows down the valve. Made by the Chicago Specialty Manufacturing Company, Chicago 25, Ill. Dual lavatories (back to back) are now being used in some homes so that the young children need not wait in line.

The National Bureau of Standards found by tests that galvanized iron pipe buried 13 years continued to have high corrosion resistance even after the galvanizing had corroded away.

• ELECTRIC HEAT APPLICATIONS

Pryne & Co., Pomona, California, have a number of electrical products designed for easy removal from recessed locations as required for dusting, cleaning or relamping. These include ventilating fans, wall heaters and lighting fixtures. Appleman Glass Works, Bergenfield, N. J., has a ceiling unit like the usual light fixture, except that it also radiates heat downward that may be useful, in particular, in the bathroom, It may be controlled thermostatically or manually with wall switches for light and heat.

The International Electric Fence Co., Inc., Caldwell, Idaho, has extended its thinking along electrical lines to include the heating of outdoor water tanks or troughs for cattle. The tanks are insulated with Fiberglass and heated by electrical strips, thermostatically controlled. Only plumbing and wiring connections are required. Attendance in cold weather is eliminated. It has been found with water adequate in quantity and temperature (50F), more milk and beef are produced, and cheaper dry feeds can be used.

• RENT FOR AIR CONDITIONING

Some air conditioners can be rented and others bought cheaper during winter months. They should make good Christmas presents although there probably will never come a time when a home owner will stop shovelling snow to welcome one in. Good servicing after it is in is important, since it costs less to keep customers coming back than to advertise for new ones.

A portable Carrier room air conditioner mounted on a cart, can be plugged in at hospitals, hotels or motels and rented to the user. Catlett-Johnson Corp., Richmond, Va. has a rental plan for air conditioning equipment. Avalaun Rental System, Dallas, Texas, will lease for five years, room air conditioners to hospitals, hotels, motels, churches, apartments and other places. After one year, the purchaser can apply 70% of the rental to purchase the equipment. Each year thereafter he can buy it still cheaper. After five years he can buy the unit for only $1. This enables a motel, for example, to reduce construction cost and to buy air conditioning later as revenue is produced.

"Always the BEST BOILER ... Now the BEST BUY!"

Thousands of top flight installations have convinced heating engineers and contractors of the outstanding advantages of the H. B. Smith "200" and "250" series cast iron boilers.

Now . . . their modest initial cost — plus major improvements in these lines — have made them literally "the best buy" for the larger homes and smaller commercial buildings.

Of prime importance is the fact that the domestic hot water heating capacity has been increased. Built-in tankless or tank type heaters now provide the largest continuous hot water supply of any boilers of equivalent capacities.

Now, more than ever, owners will benefit by "the best buy" with the installation of a Smith-Mills "200" or "250" cast iron boiler.

"...B'ilers have it over sails"

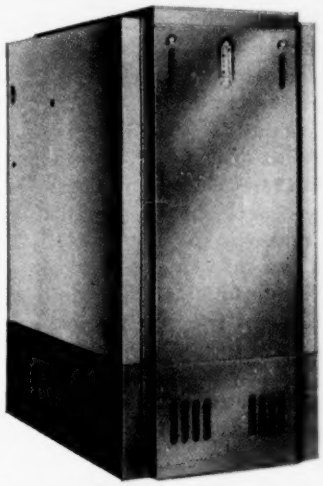
1853 1953

At the age of 23, Cornelius Vanderbilt made what became a $100 million decision. "B'ilers have it over sails," he told his wife, and scrapped his sailing ferries for steam boats. The "b'ilers" prospered over competition and his fleet became so large that Vanderbilt was popularly known as "Commodore."

From shipping, it was a short step to his fabulous success in railroad transportation.

To Vanderbilt, the boiler was allied to comfort — upper-most in his mind when one of the first H. B. Smith & Company boilers was installed in his Washington Place mansion. The contract provided for additional boiler sections, if necessary, to increase the capacity to that required for adequate heat. But although scientific methods for calculating the boiler size had not yet been devised, the original installation performed satisfactorily.

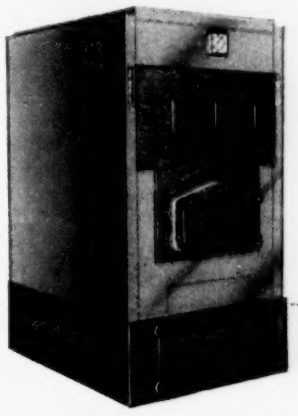
Today, Smith boilers are installed according to specific installation requirements based on scientific rating methods pioneered by the Company. But the feature which attracted the Commodore is still available to owners of Smith-Mills boilers: as building expansion is undertaken, extra boiler sections may be added to provide adequate heat and hot water.



SMITH-MILLS "200" BOILERS

With net steam I=B=R ratings of from 675 to 1275 sq. ft., the "200" is far and away the most practical heating plant for homes and small business buildings. Convertible to the use of fuels other than oil; built-in-tank or tankless domestic hot water heaters of high capacity are optional equipment. Now supplied in the new Anniversary Hammertone Blue steel jacket.

SPECIFICALLY for larger homes with two or more baths and water-consuming appliances is the "2000" Boiler-Burner unit. Splendid for small business buildings, too. Built-in tankless hot water heaters with capacities to eight gallons per minute are available.



SMITH-MILLS "250" BOILERS

Commercial or public buildings particularly benefit through the installation of the "250" unit. With net steam I=B=R ratings from 1300 to 2275 sq. ft., the "250" is the logical recommendation for present needs or for future heating requirements. Built-in-tank or tankless high-capacity domestic hot water heaters are optional equipment. In Anniversary Hammertone Blue steel jacket.

A CENTURY IN '53

OUR YEAR OF GREATEST PROGRESS

H.B. Smith

CAST IRON BOILERS

Established 1853 THE H. B. SMITH CO., INC., WESTFIELD, MASSACHUSETTS

PRODUCT APPLICATIONS

New, Unusual, or Ingenious Uses of Equipment and Materials

Conducted by WM. B. FOXHALL, Associate Editor

Parts Cleaned by Ultrasonics

PROBLEM: Jet engine fuel control parts manufactured by the Holley Carburetor Co., Detroit, Mich., had been subjected to a time consuming cleaning method consisting of scrubbing parts with a nylon brush and flushing with a solvent. Requirement for absolute cleanliness made the process unusually cumbersome.

SOLUTION: Use of a General Electric ultrasonic generator speeded up process and resulted in a more thorough cleaning job. Parts to be cleaned are placed in a solvent bag and subjected to intense high frequency sound waves produced by a quartz crystal transducer. Sound waves quickly dislodge particles of dirt.

RESULTS: The unit is in use sixteen hours a day, six days a week. Holley personnel demonstrated effectiveness of ultrasonics by cleaning several parts by the old method and then recleaning them using the ultrasonic generator. A significant amount of additional dirt was found when the solvent from the ultrasonic cleaning was filtered.

Space Heaters Specified for Steel Mill

PROBLEM: Designing a space heating system for the new $40 million strip mill of Pittsburgh Steel Company at Allenport was complicated both by size of the building and by the variation in heat requirements for steel mill operation. In the past, little consideration has been given to space heating of steel mills, primarily because rolling mills and furnaces give off so much waste heat that it has been considered unnecessary to add more heat. Modern requirements for uniform space heating combine with routine intermittent shut-down of hot operations for maintenance to create a need for general space heating.

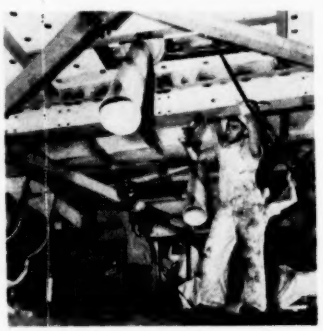
SOLUTION: To insure maximum flexibility and even distribution of heat, sixty Dravo Counterflo heaters were installed. These heaters were chosen to meet specifications for completely automatic operation, quick delivery of heat without a long waiting period, wide distribution from specific points in the plant without the use of duct work, and operation automatically on either gas or oil. Heaters were located along outside building walls, or adjacent to the inner roof supporting columns, so that vent stacks could be run up through the room without interfering with overhead cranes. Fuel distribution lines are supported along building columns with supply branches to each heater. Lines for natural gas supply carry full incoming gas pressure of 25 psi. Pressure is reduced at each heater to 4 ounces required at the burner. Fuel oil for the heaters is continuously circulated from a central storage system.

RESULTS: Automatic operation eliminates the need for full or part time operators, since heaters function in accordance with thermostat settings. Even distribution of heat is assured regardless of operations within the plant. During shut-down of heat producing operations, the danger of freezing water pipes is avoided. Air is circulated by heater fans for ventilation during both summer and winter.

Air Movers Speed Enclosed Painting

PROBLEM: For painting the interior of barges, towboats, and rooms or compartments ashore at the Neville Island Plant of Dravo Corp., a 200-lb. blower had to be transported by crane for each painting job. Setting up the blower required twenty minutes for several men.

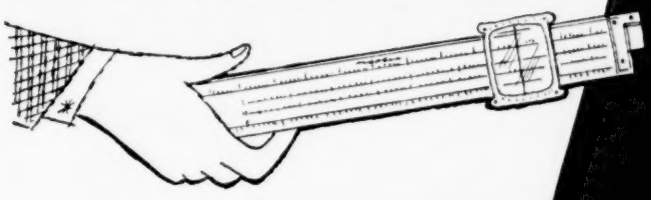
SOLUTION: The superintendent of the painting crew obtained six venturi-type devices manufactured by Mine Safety Appliances Company. These devices are portable air movers shaped like an oversized horn and operated by steam or compressed air. Each air mover weighs about thirty-one pounds. Compressed air introduced through the annular orifice in the base is discharged at high velocity from the outlet horn, inducing air movement in large volume. Those used by Dravo have a rated discharge capacity of 3150 cfm when supplied with 70-lb compressed air. For a large compartment, Dravo uses several of the air movers at once to provide ventilation during both the preliminary brushing and scraping and the subsequent painting of the interior. A push-pull arrangement may be set up using two units to blow in outside air and two units to exhaust air from the compartment. After painting, the air movers, called MSE-Lamb Air-Movers, may be used for paint drying during off-hours.

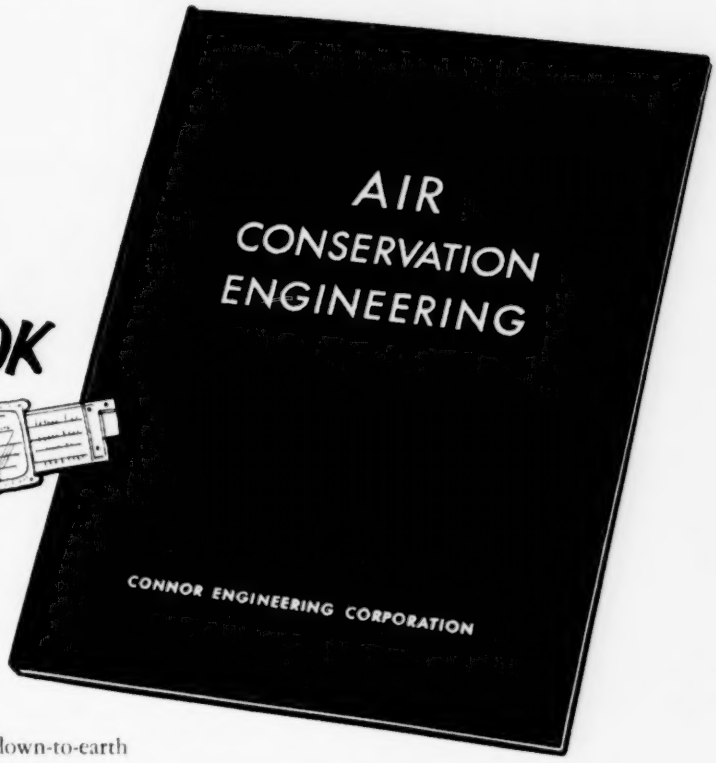


RESULTS: As plans were being drawn for a spacious because the air movers cost about one-tenth as much as electrically driven, explosion-proof blowers. There is practically no upkeep cost. Labor time is saved by portability of the units.

NOW READY

NEW EDITION OF THIS FAMOUS HANDBOOK





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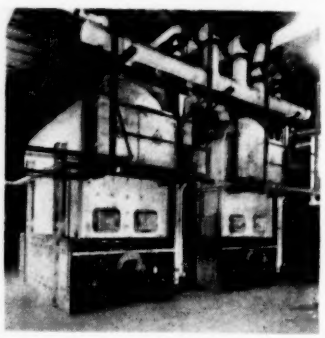
Boilers Serve Expanding Plant

PROBLEM: As plans were being drawn for a spacious one-story addition to the Vascoloy-Ramet Corp., some of the heating problems faced were: retaining, expanding, or eliminating the old boiler room containing a National Steel boiler which had served the original plant for fifteen years; continuing or changing the stoker method of firing; providing for adequate supply of domestic hot water.

SOLUTION: Excellent service record of the original National boiler influenced the firm to replace it with two new National commercial steel boilers. These were installed to serve all heating requirements in the entire plant from a new boiler room laid out in the building addition. Burners were installed to use No. 6 fuel under completely automatic controls. Low pressure steam from the tandem installation provides approximately 17 million Btu per hour. Hot water supply for lunchrooms and showers is provided by steam piped to a heat exchanger. Burners operate under a modulating control to vary the size of the burner flame.

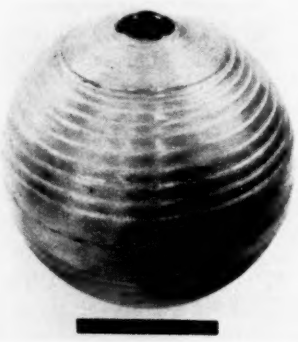


RESULTS: After a year of operation, the heating plant is living up to all expectations, and fuel bills are well within the initial estimate.

Resin and Fiber Glass Form High-Strength Tanks

PROBLEM: Bendix Aviation Corp., Teterboro, N. J. required an air pressure vessel capable of withstanding 10,000 cycles from 0 to 3,000 psig and back to 0 at 30-second intervals without failure.

SOLUTION: A new high bond strength Epon resin, produced by Shell Chemical Corp., was used in combination with Fiberglas to fabricate air storage tanks for a new jet aircraft starting system. The tank is made by running a continuous strand of fiber glass filament through an Epon resin bath and onto a low melting point mold containing the tapped air connection for the tank. After the applied glass and resin are cured under heat, the mold is melted out and recast for further use.



RESULTS: The tank is 35% lighter than comparable steel tanks, is shatter proof, and has a bursting strength of over 7,000 psig. While the tank retains its strength up to about 400 F, tanks of this type are not recommended for holding steam or hot water under pressure for considerable lengths of time.

Rio Embassy Features Air Conditioning

PROBLEM: Designing the centrally-operated air conditioning system of the new U. S. Embassy building in Rio de Janiero (the largest single-building installation in Brazil) presented complex problems. Heavy solar heat loads magnify the problem of providing flexible control for any section of each floor in accordance with the tastes of people occupying that area, without interfering with the temperature in the surrounding areas.

SOLUTION: Engineers of General Electric S.A., prime air conditioning contractors for the building, placed a huge Worthington 3-stage centrifugal compressor in the basement 30 feet below street level. The remaining air conditioning equipment was placed on the top floor. Sun shades, heat-absorbing glass, and foam-glass insulation beneath the roof were specified.

RESULTS: More than 200 Brazilian and U. S. employees will work together in the Embassy with complete individual control of the environment.

Rubber Gaskets Aid Dairy Clean-Up

PROBLEM: In the design of sanitary milk plant pipeline systems, increasing attention is being given to permanent installations which avoid the necessity of dismantling the system daily for cleaning purposes. The use of glass or stainless steel pipelines in an arrangement which can be cleaned in place poses the problem of joining the piping members in such a fashion as to make cleaning and sterilization in place a simple process. Conventional joining mechanisms create pockets for the accumulation of residue where bacteria may breed.

SOLUTION: A new stainless steel joint clamp for milk plant pipelines uses a non-toxic Hycar rubber gasket. At each joint, a self-positioning gasket is sandwiched between the pipe ends. It is fastened in place by a snap-action spring clamp, giving equal pressure around the joints and permitting a smooth, unobstructed liquid flow. Hycar American rubber is a product of B. F. Goodrich Chemical Co. and resists oils, greases, chemicals, and abrasion.

RESULTS: In addition to a substantial saving in labor costs, a pipe line system using Hycar gaskets provides a lower initial investment than conventional assemblies. Installation and take-down is fast and simple. The lines may be cleaned simply by flushing.

THERMO EXPANSION VALVES

TYPE 402
with pressure limiting feature

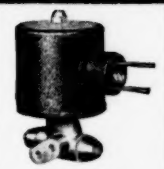
TYPE TK
"3 valves in 1"

TYPE TCL

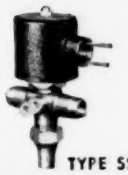
TYPE TR
Multi-Outlet

For automatic control of liquid refrigerant on all types of refrigeration and air conditioning systems. Capacities from fractional tonnage to 50 tons "Freon-12", 100 tons Methyl Chloride. Low temperature valves for −40° F. to −100° F.

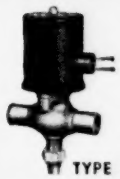
SOLENOID VALVES



TYPE S1



TYPE S2



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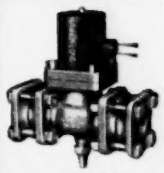


TYPE R2

For all types of service. For liquid: "Freon"—up to 75 tons. Methyl Chloride—up to 150 tons. For suction: "Freon"—up to 8.8 tons. Methyl Chloride—up to 17 tons. For brine, water, gas, air and steam.

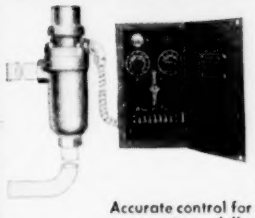
FLOAT VALVES AND SWITCHES

TYPE HK
high pressure float valve

Up to 5 tons "Freon-12", 10 tons Methyl Chloride and 20 tons Ammonia.

TYPE J5
electric float switch

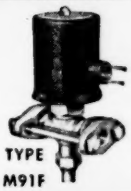
For "Freon", Methyl Chloride, Ammonia and other non-corrosive liquids having a specific gravity of .6 or more. Up to 460 volts AC and 250 volts DC.



908 LECTRO-LEVEL
electronic remote control of liquid level

Accurate control for full-flooded evaporators. Adjustable to a wide range of level changes. Easy-to-set control dials conveniently mounted in remote box. Successfully used for over 5 years.

AMMONIA CONTROLS



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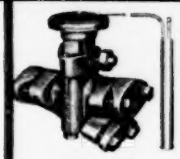

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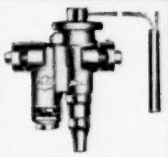

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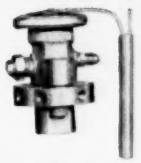

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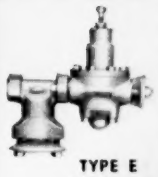
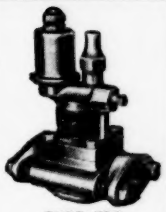


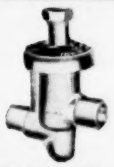
TYPE E
with Strainer

SUCTION LINE CONTROLS



TYPE EPR

For all refrigerants with connection sizes up to 6"



TYPES 771-772 SUCTION PRESSURE REGULATORS (HOLD BACK VALVES)

Prevent motor overload. Freon-12 Freon-22.

TYPE 760 "EVAPOTROL"

Pressure regulator—½ ton, "Freon-12"—¾ ton, Methyl Chloride.

Solenoid Liquid Valves — up to 172 tons. Solenoid Suction Valves — up to 28 tons. Thermo Expansion Valves—from fractional tonnage to 125 tons. Automatic Expansion Valves — from fractional tonnage to 60 tons.

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For capacities in excess of those listed, write us for further details and give specific requirements.

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FITZGIBBONS "D" TYPE STEEL BOILERS

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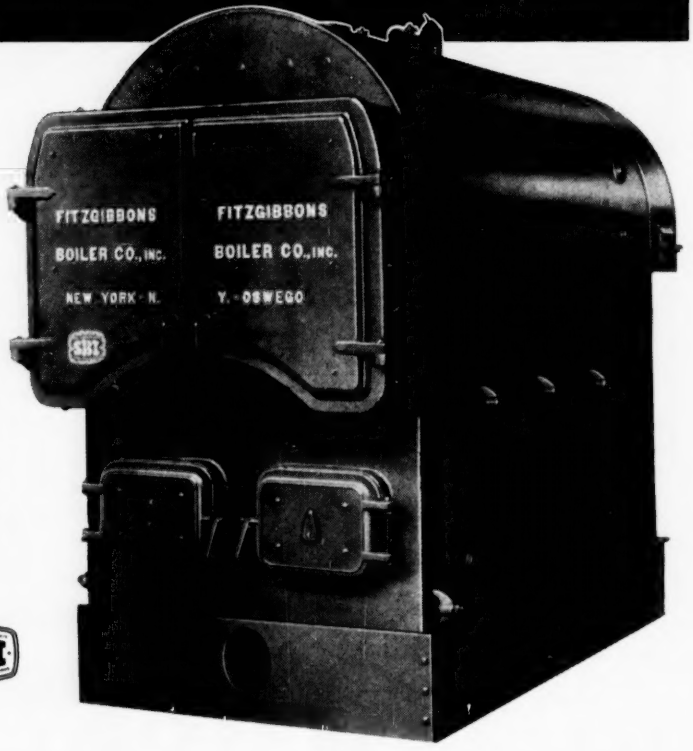

SINCE 1885

The "D" Type Catalog gives all facts and data. On request from the Fitzgibbons Boiler Company, Inc., 101 Park Avenue, New York 17, N. Y., Dept. HV-11.

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THE FITZGIBBONS BOILER®

PRODUCT INFORMATION SERVICE

Use the postage-free postcard below for further information on:

- **News of Equipment and Materials**

or a copy of the following

- **New Catalogs**

Circle the item Numbers in which you are interested and print clearly your name and address with title.

NEW CATALOGS

TUBE WELDING DATA CARD—A new reference data card, TDC-155, designed to help fabricators of tubular materials, is published by Tubular Products Div., The Babcock & Wilcox Co., Beaver Falls, Pa. It outlines pertinent details to be observed in joining similar and dissimilar alloys by arc welding, covers carbon, intermediate chromium molybdenum alloy steels and stainless steels, and outlines the electrodes to be used and suggests the preheating and post-welding heat treatments to be used for satisfactory results.....**Item 51**

HOUSE HEATING TEMPLATE—A handy template especially designed to simplify layout of home heating and cooling equipment on architectural plans is available from its dealers, according to Home Heating and Cooling Dept., General Electric Co., Bloomfield, N. J. The multi-purpose plastic drafting aid can be used for locating home heating and cooling equipment on plans and also as a guide for spotting Air-Wall system registers. Equipment outlines are ¼ inch scale...**Item 52**

PLASTIC PIPE ON THE FARM—Form 120, 4 pages, entitled Cresline Flexible Plastic Pipe, has been issued by Crescent Plastics, Inc., Evansville, Ind. The product described is a plastic pipe proved in use for jet pumps, farm water distribution systems and in industry. The bulletin includes a question and answer section about plastic pipe and gives detailed information on layout of outdoor piping systems. The company also has published a folder describing the installation of this pipe on a 300 acre farm with 5,000 turkeys, 65,000 broilers, and 50 head of cattle.....**Item 53**

CARE OF UNIT HEATERS—The Care And Maintenance Of Steam And Hot Water Unit Heaters is the title of Bulletin 12 prepared and published by the Industrial Unit Heater Association, Detroit, Mich. Four pages, bulletin shows by sketches and text the proper steps in maintaining this equipment. .....**Item 54**

WROUGHT IRON NIPPLES — Wrought Iron Nipples is the title of a folder-type bulletin prepared by A. M. Byers Co., Pittsburgh, Pa., to help technicians complete wrought iron piping specifications. The bulletin explains how to identify wrought iron nipples and contains a full page of size and dimensional data. Separate tables list stock sizes and lengths in inches of standard weight and extra strong nipples. Listings include nominal size, close nipples, special short, short, long and extra long lengths of both black and galvanized nipples. .....**Item 55**

COMBUSTION CONTROL SYSTEMS—A 4-page bulletin on its line of automatic combustion controls is issued by Standard Instrument Corp., New York, N. Y. Products included are master regulators, draft regulators, fuel-air ratio controllers, smoke alarms and robot-eye photo-electric fuel-air ratio controllers.....**Item 56**

COPPER WATER TUBE—A 16-page catalog containing complete information on its copper water tube is issued by the Brass and Copper Tube Div., Triangle Conduit & Cable Co., Inc., New Brunswick, N. J. It contains a technical section giving design and installation data to help in the proper selection and application of copper water tube.....**Item 57**

FIN-TUBE RADIATORS — Fin-tube radiators for steam or hot water, high or low pressure heating systems is the subject of a bulletin issued by Lee Vine Fin-Tube Radiator Co., Inc., New Haven, Conn. Special design feature of the new heat-distributing element is the fin with extruded conductive collar which provides contact with the steel pipe throughout its circumference and length. The radiators are recommended for industrial, commercial and residential use.....**Item 58**

BRONZE GATE VALVES—Two illustrated circulars, No. 534 and 574, graphically describing its line of 150- and 200-lb. bronze gate valves are published by The Lunkenheimer Co., Cincinnati, Ohio. The circulars, complete with dimensions, describe the advantages of flange and screw gate valves equipped with either double or solid nickel-alloy wedge discs in rising stem designs and with a single wedge disc in non-rising stem types.....**Item 59**

HEAVY OIL BURNERS — Bulletin 175G, covering its line of Model B and BR, belt-driven, horizontal, rotary-type, heavy-oil burners, which ranges from 12 to 175 gph capacity, is issued by Preferred Utilities Mfg. Corp., New York, N. Y. It describes in detail the outstanding features of both the Model B, oil, and the Model BR, oil-gas, burners. .....**Item 60**

THERMOCOUPLE DATA BOOK — The Wheelco data book and catalog, Form TC10, is published by Wheelco Instruments Div., Barber-Colman Co., Rockford, Ill., for those interested in process control problems. This new book includes information on thermocouples, protection tubes, lead wire and other accessories for use with indicating, controlling, and recording instruments.....**Item 61**

DRY TYPE PANEL FILTERS — A new 8-page illustrated bulletin No. 600 describing Staynew ventilation and air conditioning filters is announced by Dollinger Corp., Rochester, N. Y. It contains specifications, engineering and performance data covering dry type panel filters recommended for the removal of air-borne impurities. .....**Item 62**

BOILERS AND FURNACES — Four new illustrated bulletins describing its line of furnaces and boilers are issued by Robot Auto-Heat Corp., Middletown, Conn. Covered on individual specification sheets are the Auto-Heat furnace, the Master Plumber furnace, the Deluxe boiler and the Master Plumber boiler. Included in each bulletin are ratings and dimensions for the various models, as well as ordering instructions. .....**Item 63**

ELECTRIC IMMERSION HEATERS — A 30-page catalog No. 53 has been issued by Heatube Corp., Allegan, Mich., describing its comprehensive and varied line of electric immersion heaters. Catalog includes engineering data useful in solving electric heating problems.....**Item 64**

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READERS' SERVICE DEPT.

VENT HANDBOOK — Vent Installation Handbook is the title of a pocket-sized 80-page publication of the Metalestos Division, William Wallace Co., Belmont, Calif. It deals in a most interesting way with numerous illustrations how to vent gas appliances, explains the principles of gas venting and gas vent installation by step-by-step procedures. It is difficult to conceive of a venting problem which is not covered in this handbook.....**Item 65**

METAL WORKING DUST CONTROL—How dust can be controlled in metal-working industries is discussed in Bulletin 392 published by American Wheelabrator & Equipment Corp., Mishawaka, Ind. Particular attention in the bulletin is given to the use of high-efficiency cloth-tube-type dust collectors in the ventilation of grinding and annealing operations, sprue mills, and blast cleaning equipment. A section is also devoted to the role of cloth filtration in such hot operations as the collection of foundry cupola fume. The importance of product recovery is pointed out. One case cited explains how a plant completely amortized its collector by salvaging usable metal dust and enjoyed the extra profit thereafter.....**Item 66**

SLUG ELIMINATOR—Bulletn SE-1, published by M. Blazer & Son, Passaic, N. J., describes in detail the operation of the company's slug eliminator. This is a device placed in the suction line of a refrigeration compressor, to prevent liquid slugbacks, and to insure positive oil return. The bulletin describes the use of the device in conjunction with flooded or dry expansion chillers, finned coils, and also as a hot gas defroster, in sizes from 2 to 50 tons of refrigeration capacity. Dimensions are also listed. .....**Item 67**

ELECTRONIC CONTROLLER — Bulletin B226 describing the company's new line of Free-Vane electronic controllers is issued by The Bristol Co., Waterbury, Conn. It describes the latest additions to the Series 500 line of instruments, available as indicating or recording controllers for temperature, pressure, flow, liquid level, humidity, and time program.....**Item 68**

BASEBOARD INSTALLING MOVIE — A full color sound movie on baseboard installation techniques has been produced by the Trane Co., La Crosse, Wis., describing in detail every step in the installation of baseboard in residences. Star of the movie is a journeyman steamfitter, who is shown making an actual baseboard installation, beginning with a bare room and winding up with the job fully completed, the room attractively furnished and occupied. The 15-minute movie is available at no charge to contractors or contractor associations through their Trane jobber. It is also available free to educational institutions and industry associations. .....**Item 69**

ELECTRIC TESTING INSTRUMENTS—A buyer's guide on electric testing instruments is available from General Electric Co., Schenectady, N. Y. The new 16-page bulletin, designated GEA-5469B, provides data on such instruments as hook-on volt-ammeters, hook-on wattmeters, hook-on power-factor meters, portable recorders, voltmeters and ammeters, phase-sequence indicators, hand pyrometers, surface roughness scales, insulation-resistance meters, and others. Application data, features of each instrument, and prices are included. .....**Item 70**

DUST AND FUME ELIMINATORS—Two new Centri-Merge Vertical Rotor wet type dust and fume eliminators are described in Bulletin VU-8-53, issued by Schmieg Industries, Inc., Detroit, Mich. One is for wet collection and elimination only, while the other is a combination primary dry and secondary wet collection and elimination unit. The combination unit has an integral dry type pre-cleaner for dry collection of heavier and most fine particle. It is particularly useful where material salvage is an operational requirement. .....**Item 71**

TRUCK INSULATION—Folder F-13, dealing with the insulation of trucks and trailers, is issued by Fiber Glass Div., Libbey-Owens-Ford Glass Co., Toledo, Ohio. Space and weight-saving factors of the company's fiber glass are emphasized. Tables showing sound absorption data, thermal conductivity curves, and standard product data are included and four case history examples of the use of the fiber glass insulation are presented. .....**Item 72**

COMPRESSION COUPLING — Folder 103 has been issued by Morris Coupling and Clamp Co., Ellwood City, Pa., on its Economy coupling. It explains how this new coupling eliminates the necessity of threading, flaring or grooving prior to installation of pipe unions. This feature permits minimization of casing size and enables users to standardize on pipe sizes, with substantial savings.....**Item 73**

INDUSTRIAL STEAM TRAPS — Bulletin 853, covering industrial steam traps, is issued by W. H. Nicholson & Co., Wilkes-Barre, Pa. It features steam traps equipped with bellows of bronze, monel or stainless, and bodies in bronze, semisteel and cast steel construction in sizes ¼ to 2 inches, for all pressures from vacuum to 300 lb. Included are capacity tables, dimensions, recommended piping diagrams, typical applications, tables and data covering the selection of traps for various types of steam-using equipment.....**Item 74**

LIQUID SEALS FOR REFRIGERATION—Bulletin 241 on how to keep high pressure refrigerant gas out of the evaporator when the liquid level in the receiver drops below the outlet pipe, is issued by Armstrong Machine Works, Three Rivers, Mich. It covers operation, selection and installation of the company's cast semi-steel and forged steel liquid seals and expansion valves. .....**Item 75**

AIR CONDITIONING COILS — Bulletin 103-53 is offered by Tenney Engineering, Inc., Newark, N. J. It illustrates and describes the company's new line of standard 4-row air-conditioning coils. These coils, available for quick delivery, are designed for use with domestic and commercial comfort-cooling systems. Included is information on coil construction, application data, and prices.....**Item 76**

TUBULAR STEEL SCAFFOLDING — A 6-page color folder, No. 53, illustrates various panel styles and identifies proper application of advance tubular steel scaffolds, made by Beaver Art Metal Corp., Ellwood City, Pa. It contains a description of the patented method of panel and brace assembly with self-contained cam and stack locks which speed up assembly and dismantling through elimination of bolts, nuts, clamps and other time consuming methods of attachment.....**Item 77**

PACKAGED WATER TUBE BOILER — A new four-page folder is published by The Bigelow Company, New Haven, Conn., giving details on the company's new line of shop assembled, water tube boilers. Bulletin includes a description of the Type H boiler, along with illustrations of the unit in process of shop assembly and finally completed. Advantages listed include the fact that the boiler is shipped ready to operate as soon as service connections are made. Also shown are dimension drawings and a table of capacities, dimensions and weights for ten standard sizes ranging from 8000 to 30,000 pounds steam per hour.....**Item 78**

FOAMED PLASTIC INSULATION—Nopco Lockfoam—New Foamed Plastic is the title of a 28-page booklet published by Nopco Chemical Co., Harrison, N. J. It outlines Lockfoam's uses as a material for construction, thermal insulation, and vibration dampening. As a heat insulator, the material has a *K* factor of .018 to .025, depending on density, and is a gas-expanded foamed plastic.....**Item 79**

DIAL THERMOMETERS—A 16-page bulletin, No. 467, describing dial thermometers for long distance measurement, is issued by The Foxboro Co., Foxboro, Mass. Emphasizing the variety of ranges, and the bulbs, tubing and accessories available, the bulletin provides complete data on temperature indicators of the vapor pressure and gas pressure types.....**Item 80**

FLOAT AND LEVER VALVES—Catalog 107 illustrating and describing the company's float and lever valves is issued by Schade Valve Mfg. Co., Philadelphia, Pa. Information on valve selection as well as a comprehensive description of each valve is included. .....**Item 81**

PLEASE SEND US MORE INFORMATION. Circle below item numbers on which you wish further information.

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Nov. H-53

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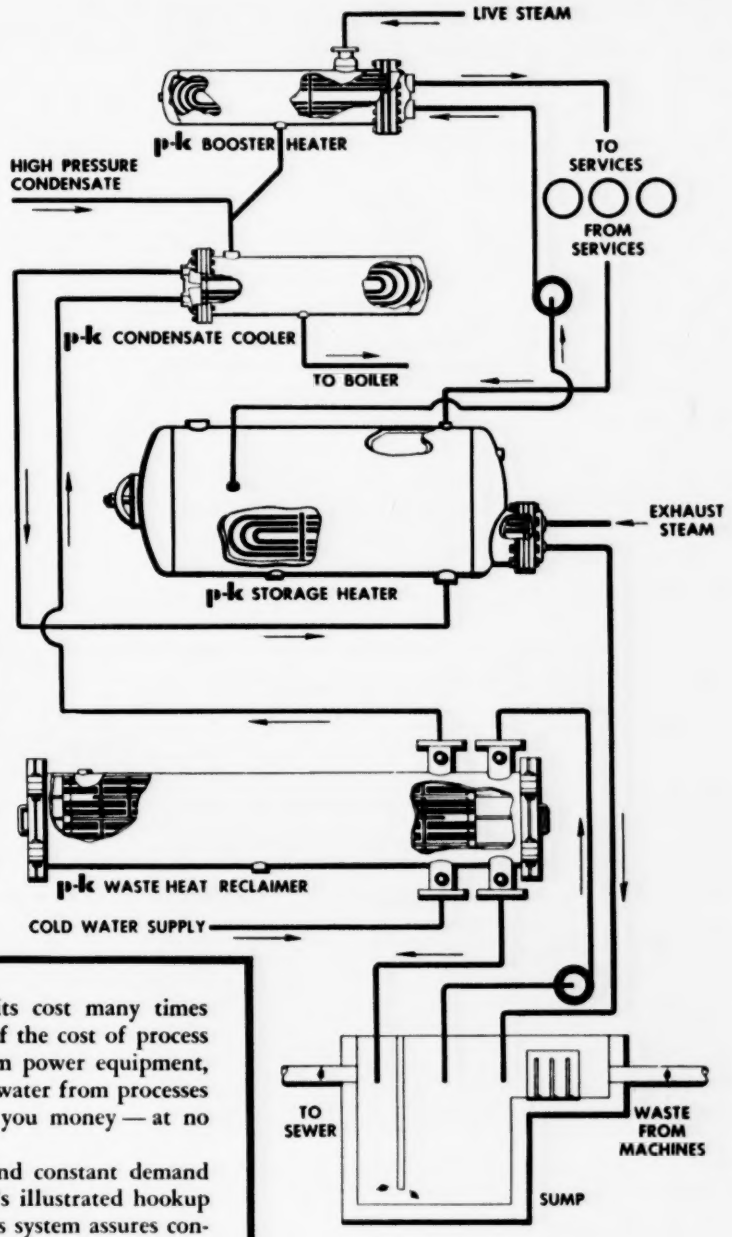

p-k hot water supply system — one of numerous variations — for maximum heat recovery in processes using large quantities of hot water.
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NEWS OF THE MONTH

SNOW MELTING RAMPS

to provide skidproof access to Boston's new $25-million Aerial Highway. Utility steam is heat source.

Boston's new $25-million Aerial Highway now being constructed may serve as the model for the highway of the future. Its designers are installing heating pipes to melt snow and ice from all access ramps of the new thoroughfare. When completed, the Boston expressway will be the largest snow melting installation in the country.

The heated ramp pavement protects motorists from skidding hazards created by freezing rains and snow, eliminating the major cause of traffic congestion in winter.

Section of ramp to new Aerial Highway showing exposed iron pipe grids in place ready for concrete road surface to be poured.

To assure dry road surfaces in the cold months, wrought iron pipe grids are being embedded in each of the seven ramps serving the new highway. The pipe is welded into 10-foot by 22-foot grids which are arranged in series and buried in the concrete pavement.

The individual ramps have their own snow melting system with pump, heat exchanger and pipe units. The total melting area amounts to more than 161,000 sq ft of concrete pavement.

• **METHOD.**—To operate the systems, steam supplied by Boston Edison Company, is fed to heat exchangers. Water mixed with ethylene-glycol anti-freeze, is circulated through the heat exchangers and pipe networks. The heated concrete pavement prevents ice from forming and melts snow as it falls.

Each snow melting system is designed for automatic or manual operation—or for a combination of both. Thermocouples are being embedded in various sections of the concrete to contribute to comprehensive study of the systems in operation. The ramp snow melting systems are expected to help keep traffic flowing on the Aerial Highway even during the most severe snow storms.

The highway was designed by architects-engineers Fay, Spofford & Thorndyke and the Commonwealth of Massachusetts Bridge Department.

RADIANT COOLING

featured in Toronto office building. Panels serve heating and cooling systems. Air controls humidity.

The new head office building of Manufacturers Life Insurance Co., Toronto, Canada, incorporates the latest European and American developments in the field of radiant heating and cooling, providing employees with a year-'round controlled climate for working comfort. The system should be effective in cutting time loss due to the discomforts of excessive summer heat. It can be applied to the old buildings as well as to the new on an almost identical basis. For this project, Mr. Charles E. Leopold of Philadelphia was retained as air conditioning consultant. His experience included the Pentagon Building in Washington, D. C.

• **FIRST IN CANADA.**—The Manufacturers Life system is radically different from any yet installed in Canada. As far as is known, it is one of the first installations of its nature in a large office building on this continent. The system's unusual feature is that cooling is accomplished by cooled surfaces. Heating and cooling are in part performed through the medium of aluminum panels. These panels, which are located under the windows and in the ceiling, are backed with copper tubing through which water circulates. The ceiling itself is suspended from the floor above, which enables all tubing and air ducts to be completely hidden.

There are two types of ceiling panels. One, a continuous three foot wide perimeter band around the edge of the ceiling, is used primarily for cooling to compensate for heat received directly from the sun and as a supplementary heating element for extreme conditions in winter. The main heating elements are the sill panels under the windows. These panels help to cool in summer. Other ceiling panels form part of the reflector of the recessed lighting troffers as well as part of the ceiling. The main function of the panels around the light units is to absorb the heat given off by the lighting tubes as well as heat from machines and human activity. These panels operate on a cooling basis throughout the year.

• **COOLING.**—The heart of the cooling system for the air conditioning is a centrifugal refrigeration compressor driven by a 750 hp motor. Its cooling capacity is rated at 800 tons. Another major component of the cooling system is a cooling tower located on the roof of an annex behind the building. The cooling process starts with ab-

(*Continued on page* 122)

ROTO-CLONE GIVES TANNERY DUST "BUM'S RUSH"

Type W ROTO-CLONE quickly converts fine and fibrous materials into harmless sludge

The picture tells the story! Here you see three leather finishing machines in a Milwaukee tannery—brusher, counter brusher and buffer. Each produces dust in heavy concentration made up of fine, fibrous materials. Yet, even with two units operating, dust is nowhere in evidence!

Now follow the exhaust ducts to the upper right corner of picture. There you find a Type W ROTO-CLONE equipped with Precleaner which exhausts the dust from all three machines. The Precleaner removes the bulk of the heavier, fibrous material. Then the ROTO-CLONE, combining dynamic precipitation with water sprays, collects the remaining fines.

The Type W ROTO-CLONE's method of wet collection permits uniform high efficiency over a wide range of dust loads—eliminates a potential fire hazard—collects the dust in the form of an easily-disposed-of sludge. AAF's complete line of ROTO-CLONE Dust Control Equipment offers a product to meet every industrial problem. Call your local AAF representative, today, or write direct for Bulletin No. 274.

AAF

American Air Filter

COMPANY, INC.

294 Central Avenue, Louisville 8, Kentucky • American Air Filter of Canada, Ltd., Montreal, P. Q.

RADIANT COOLING

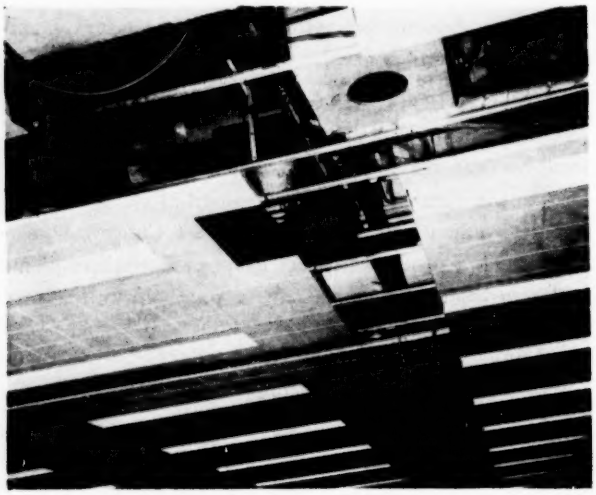
(*Continued from page* 120)

sorption by the aluminum panels of heat accumulating in the various offices and work areas in the building. From the panels the heat is transmitted into chilled water circulating through copper tubes within the suspended ceiling and behind wall areas below the windows. A second circuit of chilled water is passed through finned tube coils. Outdoor air is passed through those coils where a portion of its moisture is removed.

• **AIR FLOW.**—As the major heating and cooling requirements are accomplished by means of radiation and absorption, the air supply is used principally for necessary air changes and control of humidity. Because of this limited function, the volume of air required is about 40% of that required for conventional systems. This factor provides a number of important advantages. There has been a saving in space because of the use of smaller air ducts, which was also a factor enabling ceiling heights to be maintained throughout the old and new structures. Fan rooms are located either in the sub-basement or in the machinery penthouse. No fan rooms are needed on intermediate floors to cut down on office space. With this predominantly radiant system, temperature changes of six degrees in winter produce little adverse effect on human comfort, but with air flow alone to accomplish heating and cooling a change of two degrees can produce noticeable effects. With relatively little air entering offices, no drafts are created.

The air is humidified in winter and dehumidified in summer. Both fresh air and re-circulated air are cleaned by means of filter screens as well as by electrostatic filters. The system will maintain approximately 50% relative humidity in the summer and 30% in the winter. Grilles or diffusers placed in the ceiling distribute the air evenly throughout the building.

• **HEATING.**—The core of the heating system is a steam boiler plant with three water tube boilers, two operative under maximum conditions and one standby. Space has been provided for two additional boilers if future building expansion is found necessary. The burners are fired by heavy bunker oil. The storage tanks are located underground for safety reasons. Steam is delivered at 42-lb pressure at the boilers and is piped through an interconnecting tunnel between the boiler plant and the main building to heat exchangers which transmit the heat into the water circulation system for the heating panels. The installation is designed to maintain temperatures of 72F to 75F in both summer and winter. The architects of the building were Marani & Morris of Toronto.



Unfinished ceiling shows part of cooling water system attached to acoustical pans and light troffers. Air supply handles humidity load.

• **PLUMBING.**—There are spacious washrooms on each floor. Installations feature wall hung plumbing and large wash basins with spray faucets. Mirrors and hand towel units are recessed into the walls and trim and accessories are of stainless steel. On the 12th floor (machinery penthouse) is located the cooling system for the drinking fountains which chills the water for all 28 fountains in the building. In the elevator hoist penthouse are two huge water tanks, rectangular in shape, holding 30,000 gallons of water. As the city water pressure is capable of servicing only the first three floors of the building, these tanks are necessary to maintain pressure required for the remainder of the building.

METAL CORROSION

in soils can be studied in six-month lab routine as reliably as ten-year field tests, NBS says.

A recent study by the National Bureau of Standards shows that reliable data on the corrosion of ferrous metals in soils of various types can be obtained in the laboratory in a period of six months instead of requiring field tests lasting 10 years or more. W. J. Schwerdtfeger of the NBS corrosion laboratory conducted the investigation.

Corrosion was produced in small laboratory cells by controlled aeration of metal disks in contact with soil within the cells. The results for 15 different soils showed good correlation with the corrosion observed on wrought specimens in long-term exposure tests. The technique used by the Bureau should provide a valuable basis for predicting the service of iron and steel structures exposed to various soils.

• **PROCESS.**—To evaluate the laboratory corrosion cell as a means for predicting corrosion in the field, samples of soil collected at 15 NBS exposure sites were used. The results were correlated with weight-loss measurements made on short lengths of steel and wrought iron pipe which had been exposed for 10 years at the same 15 localities. An empirical equation relating the laboratory and field data indicated that the laboratory measurements could be used to predict field weight losses with root-mean-square error of about $\pm$ 4 oz per sq ft for corrosion rates ranging from 2.5 to 30 oz per sq ft for the 10-year exposure period. Because the 15 soils covered the range of corrosivity of the soils of the United States, this empirical relationship may be applicable to any soil.

(*Continued on page* 124)

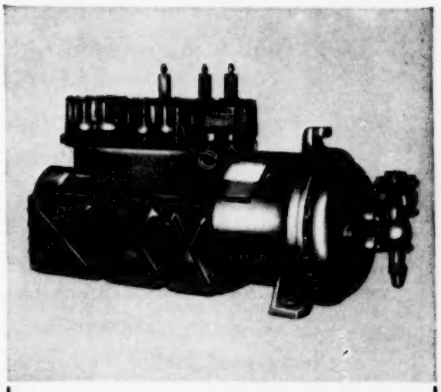
In Connecticut, a new idea.

CHILLED COOLANT
BOOSTS BRASS OUTPUT

Here's an unusual application: a stock Westinghouse air conditioning compressor which speeds up rod production. First of its kind in the brass industry.

At Scovill Mfg. Co., they roll ¾" rod down to ¼", using special 12-stand mills running 24 hours a day. Our Connecticut distributor, J. P. Salmini Co., helped them improve this process. By pumping chilled coolant over the rod before it enters the rolls, they get these profit-making benefits: 1) increased output; 2) life of rolls tripled; 3) a better and more uniform finish; and 4) cleaner working conditions due to reduced oil smoke.

If your problem is product cooling—or process or comfort air conditioning of any kind—we can help you. Experienced Westinghouse distributors like J. P. Salmini Co. are located across the nation. Let one of them increase your profits with new ideas. He's listed under Air Conditioning in your classified telephone book. Westinghouse Air Conditioning Division, Hyde Park 36, Mass.



This is the compact, lightweight compressor which not only makes these production savings possible, but adds its own savings: less maintenance, longer life, peak efficiency and low operating cost. The hermetically-sealed design is the reason. No belts, pulleys, or shaft seals. It cools itself with the refrigerant it pumps!

WESTINGHOUSE AIR CONDITIONING

YOU CAN BE SURE... IF IT'S Westinghouse

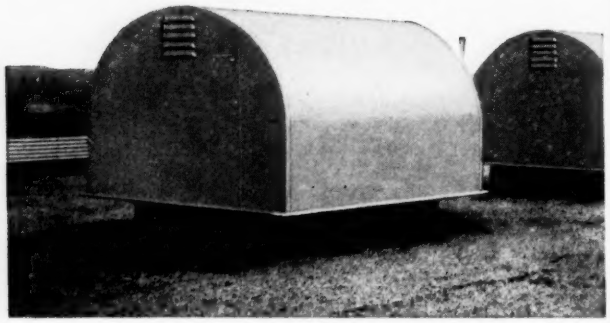
J-80324

You **Know** what you're getting in

Airlift . . .

the completely certified

Swartwout duct exhaust ventilator



There's no guessing about actual results obtainable from the new Swartwout Airlift. The dynamically balanced heavy-duty centrifugal fan and the complete ventilator unit have been tested by an independent laboratory. The 138 capacity variations (covered by 14 ventilator sizes) have been determined in accordance with the test code adopted by NAFM and ASH & VE. Airlift is guaranteed to deliver catalogued capacities at listed static pressures.

Airlift has an unusually effective fan wheel, permitting lower tip speeds than usually possible — which means lower noise levels. Other design features reduce turbulence and increase efficiency. Power unit and fan are easily accessible in this new design. Write for Bulletin AL-H.

50 YEARS SERVICE TO INDUSTRY — 1903 • 1953

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The Swartwout Co.

Roof Ventilators and Ventilating Louvers

POWER PLANT EQUIPMENT • PROCESS INDUSTRY CONTROLS

METAL CORROSION

(*Continued from page* 122)

• **RESULTS.**— It was found that the corrosion cell could detect significant differences between the corrosion rates of cast iron and steel, which are generally considered to corrode at about the same rate in soils. Thus, the cell might be used to study the effects of variables, including composition upon the corrosion rates of steels. It is also reasonable to expect that laboratory corrosion cells could be used to predict the corrosion of nonferrous metals—copper, brasses, lead, zinc and possibly aluminum—in various kinds of soils. Although measurements with the laboratory cell should not be considered as replacing field exposure tests entirely, it is unlikely that materials which corrode at the same rate in the laboratory would corrode at significantly different rates in the field. Hence, the corrosion cell should serve a useful purpose in the selection of materials for field exposure tests.

NEW LOOM

eliminates need for high humidity in weaving rooms. Ducts collect lint, serve air-conditioner.

A new development in textile weaving which eliminates the humid atmosphere of the cotton weave shed was demonstrated recently in the Iselin-Jefferson Building at 90 Worth Street, New York City. New standards of cleanliness and sanitation in cotton goods production are now possible, as well as comfort for mill employees.

• **EXHAUST.**—The new development, conceived by Borden Mills executives and manufactured by the Hunt Loom and Machine Works of Greenville, S. C., utilizes an exhaust air trough under the drop wires controlling the stop-motion mechanism. This removes all the lint from the warp yarns running through the loom and thereby makes it unnecessary to keep the room at relative humidity of more than 90% to dampen the lint and prevent it from flying around.

The lint freeing operation is aided by an overhead traveling air blower, which can service several looms, and by carry-off ducts on the floor which take the air to a conditioner that restores the proper moisture content.

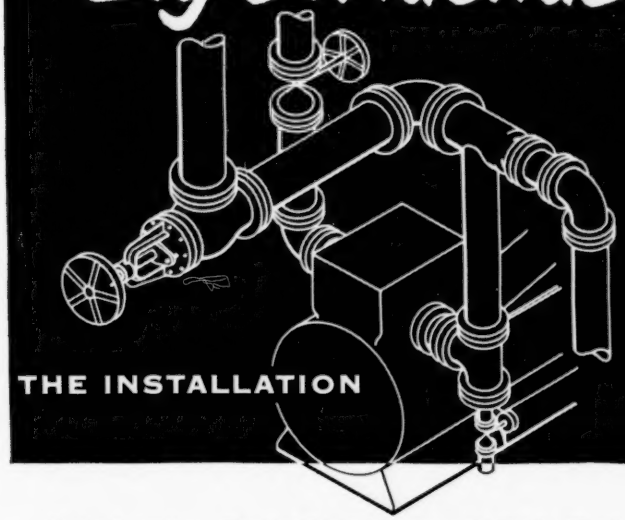
• **NYLON GEARS.**—The loom also utilizes for the first time nylon gears, which can operate without lubrication, in conjunction with steel gears. Each loom contains ten nylon gears.

The Hunt looms will operate at a speed of about 186 piks a minute and will turn out 45-inch, 64- x 56-print cloth. The loom will sell for about $1400. Additional cost for air-filter installation will vary, depending on the type of location and condition of the buildings.

Although not designed specifically to decrease weave room noise, the lowering of humidity content will permit installation of acoustical ceilings which heretofore could not be used in the damp rooms. Use of nylon gears, oil-

(*Continued on page* 126)

Thrifty Valve Buying in 1918 Still Paying Big Dividends



THE INSTALLATION

At the American Crystal Sugar Company's Rocky Ford, Colorado, mill where Crane 12-inch iron body angle valves control carbon dioxide to pumps supplying the gas for carbonation process.

THE CASE HISTORY

This CO_2 service requires valves of utmost dependability to protect process and equipment from damage. In the event of malfunction or failure of pumps, the valves must assure positive closure every time.

That's precisely the quality of performance Crane No. 353 valves have given in this service for more than 35 years. The mill's long inactivity between 75-day production campaigns hasn't made the job easier. Yet, these valves have never been out of the lines for repairs; they've remained on the job since 1918 with only routine maintenance.

Valves that set performance records like this aren't bought on price alone—it's quality that counts most. That's thrifty buying—still the only way of getting the best value.

VALVE SERVICE RATINGS

SUITABILITY:	Never failed in 35 years
FEATURES:	Simplified design—easy to service
MAINTENANCE COST:	None—Routine care only
SERVICE LIFE:	Installed 1918—still O.K.
OPERATING RESULTS:	Dependable CO_2 control
AVAILABILITY:	Crane catalog item—No. 353

THE VALVE

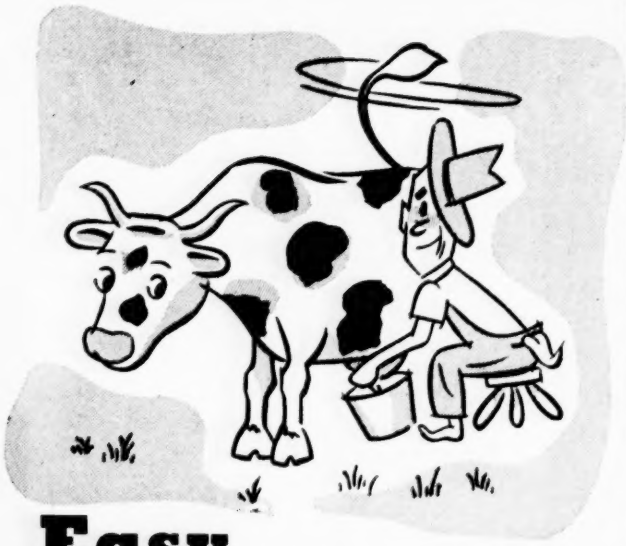
You can see the ruggedness and serviceability of No. 353 angle valves, but it's what's inside that counts most in their better performance. Choose these valves from the complete family of Crane 125-pound iron body globes and angles. It gives you the widest selection of patterns and types for steam, water, oil, and gas. See your Crane Catalog or your Crane Representative.

THE BETTER QUALITY...BIGGER VALUE LINE...IN BRASS, STEEL, IRON

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING



Easy Accessibility

We don't know his name—but we do know it is a great idea, it makes for easy accessibility, this singular important factor increases its usefulness a thousand times.

A sound thinking engineer would say, "Easy Accessibility" greatly improves the usefulness of all equipment and machinery, even to the point that it sometimes is the greatest influence to their decision.

Easy accessibility to all parts and accessories of an Olson Heater is another contributing factor that makes it the intelligent heater selection.

The fact that Olson Heaters are built rugged for dependable service can not be denied—Write for the detailed step-by-step catalog and you'll know why.

Olson

DIRECT FIRED HEATERS
Gas, Oil, Coal or Dual Gas and Oil

ARTHUR A. OLSON & COMPANY
BROAD STREET, CANFIELD, OHIO

NEW LOOM

(*Continued from page* 124)

impregnated bushings and antifriction bearings will further reduce noise, as will a direct motor drive on the loom.

• **SAVINGS.**—Savings can be effected by elimination of moisture, which tended to rust all metal parts of the loom. The greatest saving, however, will be the reduction of loom stops caused by excess lint, and the elimination of missing threads and oil-discolored cloth. A production increase of 4% has already been achieved in long term tests, it was said.

RESIDENTIAL COOLING

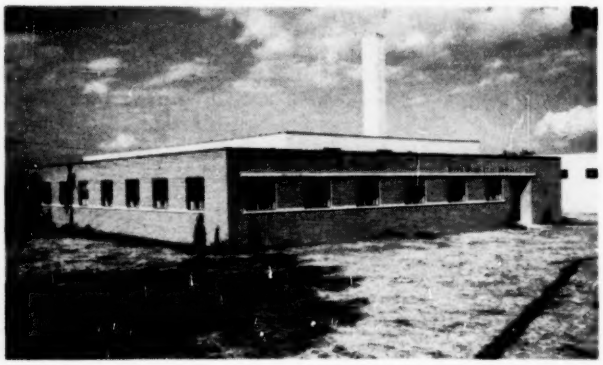
installations now to be included in FHA insured mortgages. Requirements for acceptability stated.

Residential cooling installations may now be included in FHA insured mortgages, according to Mechanical Engineering Bulletin ME-10, issued by the Underwriters Division of the Federal Housing Administration.

Generally speaking, installations acceptable to FHA must include duct-work serving as a minimum the living room and any adjacent spaces not separated by doors and at least one other room. This requirement means that duct systems must be used with residential cooling equipment.

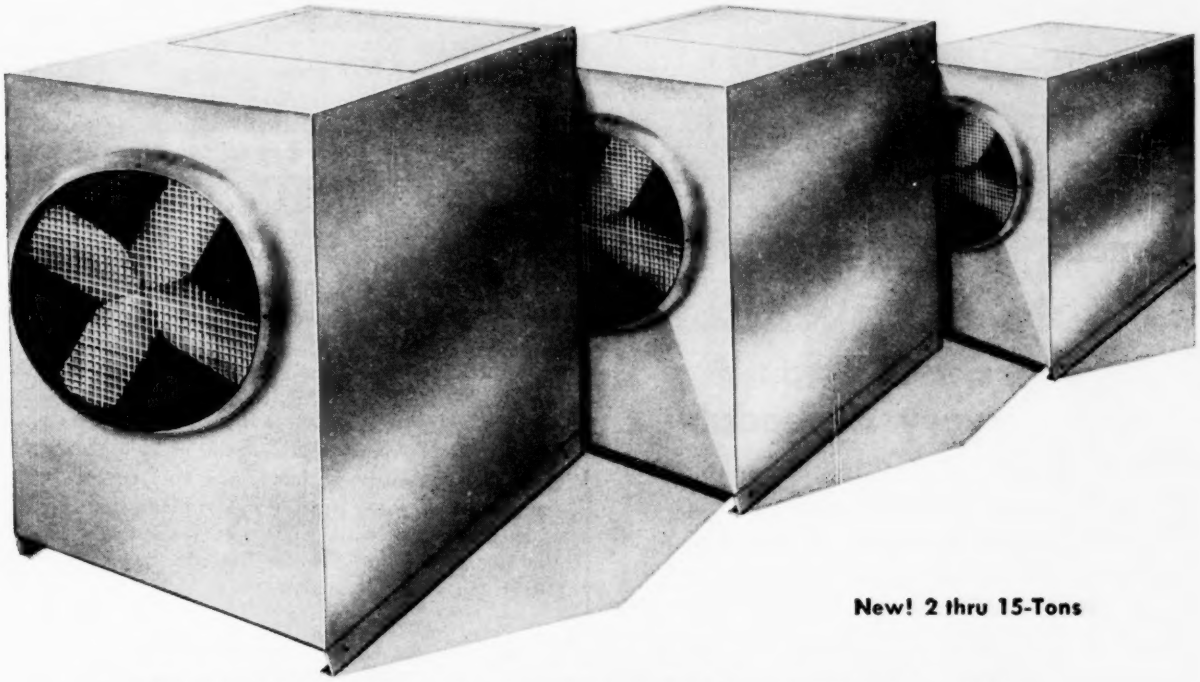
The points covered in the FHA submission form are as follows:

a. Outside design dry bulb and wet bulb temperatures.
b. Inside design dry bulb temperature and relative humidity.
c. Time of day heat gain is calculated.
d. Operating cfm and static pressure available.
e. Temperature of air entering and leaving coil.
f. Sensible and latent capacity of the unit.
g. H.P., rpm, and power input to each motor.
h. Thermostatic control make, type, and location.



First industry-owned laboratory for Bituminous Coal Research Inc., Columbus, Ohio, to house research and technical promotion.

RESIDENTIAL COOLING TOWERS



New! 2 thru 15-Tons

ONLY HALSTEAD & MITCHELL OFFERS THE

20-Year Guarantee!

ON THE WETTED DECK SURFACE

PRICED FOR THE HOME MARKET

Price-wise these Halstead & Mitchell Residential Cooling Towers throw open huge segments of the home and small building market to air-conditioning. Here is the development for which the industry has been waiting. Check prices today!

NOW REQUIRED IN MANY AREAS

Residential Cooling Towers recirculate precious water . . . meet requirements of municipalities which prohibit wasting cooling water to sewers. And low cost H&M units take residential air conditioning to the suburbs and rural area . . . recirculate from a cistern if need be!

MADE FOR REAL OPERATING ECONOMY

Economical, lastworthy . . . low operating cost matches low initial cost. Efficient gravity-type distributing pan eliminates windage loss since atomizing by spray nozzle is unnecessary. Low pump head pressure is another bonus of gravity distribution. And maintenance is a snap!

FAMOUS HALSTEAD & MITCHELL QUALITY

Here's *all* the quality for which Halstead & Mitchell Cooling Towers are world famous — including the 20-year Guarantee on the wetted deck surface of pressure-treated creosoted wood, against attack by rotting or fungi growth. Stainless steel fans and shafts, plus individual cabinet coatings of Vinsynite, Vinyl Zinc and chlorinated rubber add important years of life. The complete assembly is with Everdur bolts . . . disassembly is easy even after years of service.

AT LEADING WHOLESALERS EVERYWHERE

Write for descriptive bulletin from Halstead & Mitchell, one of the world's largest manufacturers of water-cooled Cleanable Condensers, and Cooling Towers up through 100-tons.

Halstead & Mitchell

OFFICES: BESSEMER BUILDING • PITTSBURGH 22, PA.

Famous Pittsburgh firm uses

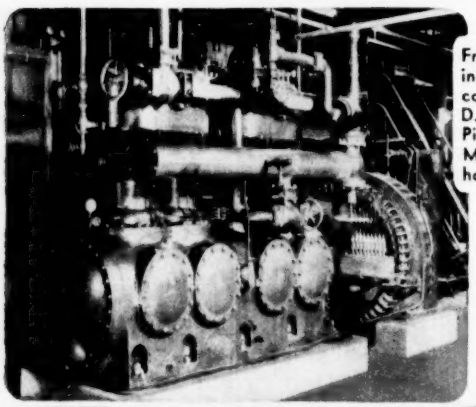
Frick Refrigeration

35 years, and finds it very dependable

The D. L. Clark Company, manufacturers of the world famous Clark Bar, and Clark Brothers Chewing Gum Company now operate eight large Frick refrigerating machines in their Pittsburgh Plants. The first of these compressors, installed in 1918, is still in service. Other Frick equipment includes condensers, coolers and controls.

Today, Clark Bars and Clark's Teaberry Gum are famous the world over. Frick air conditioning and cold storage systems play a vital part in maintaining the quality of all Clark products.

There's hardly a business that cannot profit from the use of similar Frick cooling equipment. Let us quote on the system YOU need.



Frick 4-cylinder ammonia compressor at D. L. Clark Co., Pittsburgh. Motor has 300 horsepower.

DEPENDABLE REFRIGERATION SINCE 1882

FRICK CO.

WAYNESBORO, PENNA. U.S.A.

Also Builders of Power Farming and Sawmill Machinery

(*Continued from page* 126)

• W. E. Gleeson, previously Western district manager of McDonnell and Miller, Inc., has now taken up the duties of sales promotion manager at the home office in Chicago.

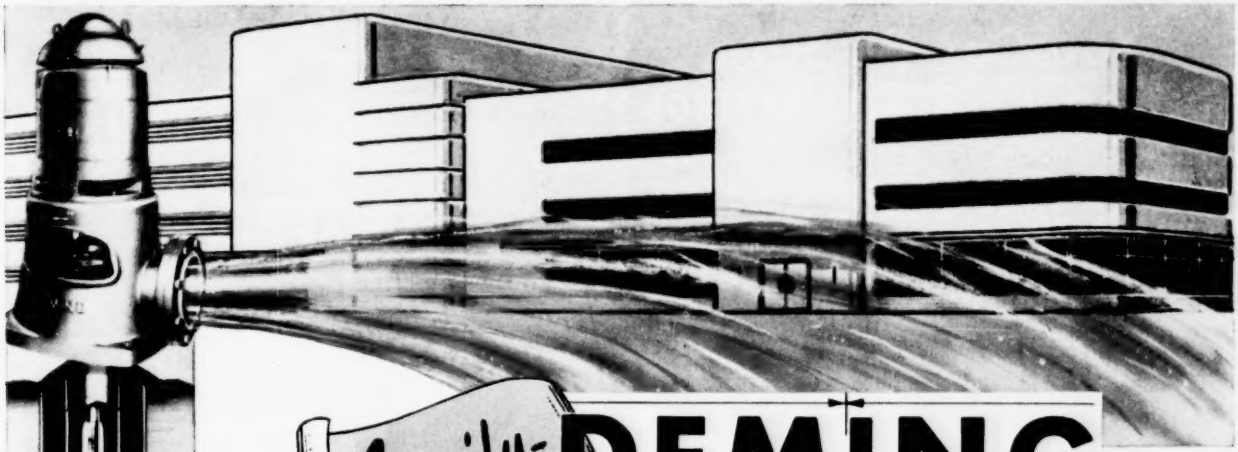
• Bell & Gossett Co., Morton Grove, Ill., recently welcomed a large group to luncheon and dedication of the company's new school house. Speakers included Mr. E. J. Gossett, president, R. E. Moore and C. E. Pullum, vice presidents. Colonial in outward appearance, the B & G Little Red School House is completely equipped for modern visual educational methods. Lighting and acoustical control as well as the latest in radiant heating and cooling will enable classes to be conducted under ideal comfort conditions. Complete courses under competent instructors will be available to contractors, journeymen, engineers and architects.

• Horace I. Schmidt has been appointed sales manager of Halstead & Mitchell. Mr. Schmidt, a graduate of Carnegie Institute of Technology, leaves his own business as manufacturers' representative to work with Halstead & Mitchell. Previously he had spent six years as district representative with the Bush Manufacturing Co., two years as engineer with the Diceler Ice Machine Co., and nine years with the Fedders Manufacturing Co. as engineer and district manager.

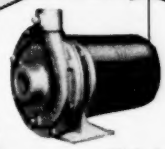
Canadian Degree-Days for September, 1953*

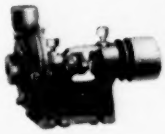
City	September	
	1953	Normal
Calgary, Alta.	405	432
Charlottetown, P.E.I.	186	222
Crescent Valley	369	360
Edmonton, Alta.	403	444
Fort William, Ont.	419	354
Grande Prairie, Alta.	450	480
Halifax, N. S.	171	189
London, Ont.	204	126
Medicine Hat, Alta.	227	267
Moncton, B. C.	238	282
Montreal, P. Q.	150	180
North Bay, Ont.	358	264
Ottawa, Ont.	254	204
Penticton, B. C.	223	213
Porquis Junction, Ont.	507	396
Prince George, B. C.	477	444
Quebec City, P. Q.	236	276
Regina, Sask.	357	408
St. John, N. B.	246	270
Saskatoon, Sask.	360	396
Toronto, Ont.	154	168
Vancouver, B. C.	195	234
Victoria, B. C.	234	264
Windsor, Ont.	120	54
Winnipeg, Man.	363	330

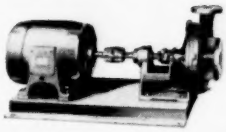
*These data are supplied through the courtesy of the Meteorological Division, Air Service Branch, Department of Transport, Canada.



Specify DEMING PUMPS

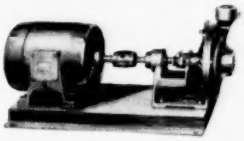






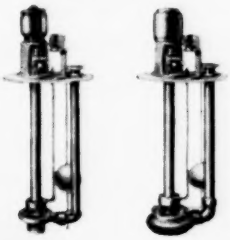
Think of DEMING PUMPS as *"the 1,000 line"*. More than 1,000 types and sizes with various power drives and available for your selection.

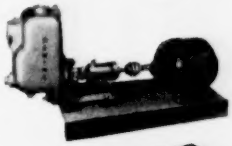
The problem of selecting the right pump for a specific job is simplified by Deming catalog bulletins. These illustrated bulletins contain performance tables, sectional views showing construction features and other helpful information.



Deming Distributors are located strategically for prompt cooperation. Everything you require to assist you on problems of pump selection is available from one reliable source—DEMING PUMPS—*"the 1,000 line!"*

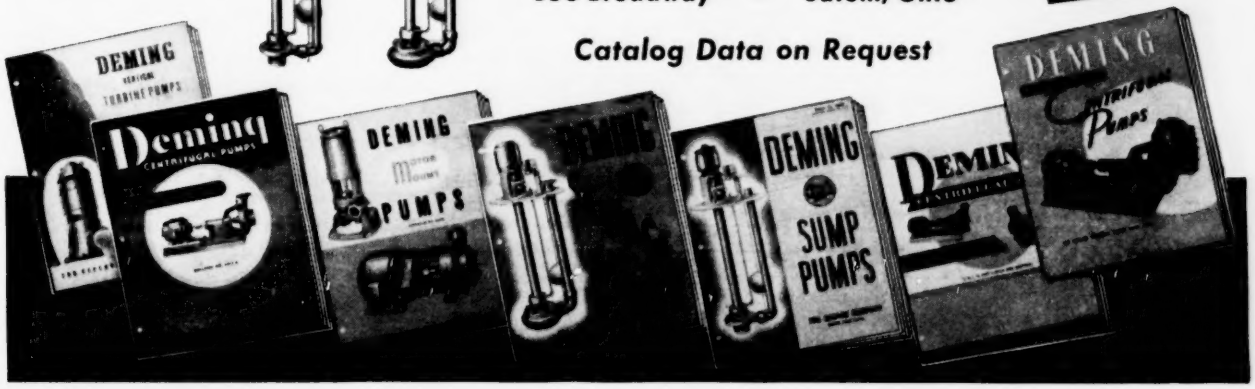
See Deming Pumps on display at Booth No. 819, All-Industry Refrigeration and Air Conditioning Exposition, Public Auditorium, Cleveland, Ohio, Nov. 9-12.





THE DEMING COMPANY
558 Broadway • Salem, Ohio

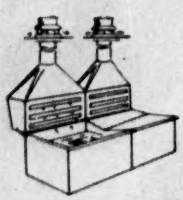
Catalog Data on Request



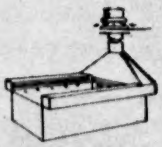
You Can Be Sure
GALLAHER CERTIFIED RATINGS
mean Peak Performance
HERE'S WHY

Gallaher ratings are the result of actual physical tests of the entire unit—*not* a fan wheel alone or other component, *not* interpolations of free air data, but a true picture of the unit as it operates under actual conditions.

Any other method of rating a power roof exhauster will be inaccurrate. Gallaher research has shown conclusively that the errors may run as high as 50% when ratings are mere theoretical calculations.



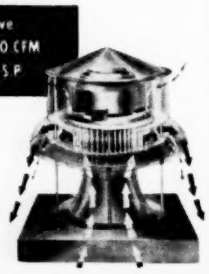
Gallaher units with patented, built-in *scroll effect* are the only power roof exhausters which can develop high static pressures. With this feature, thousands of industrial applications are well within the range of economical power roof exhausters. They have been rated in an independent laboratory under the direction of a nationally recognized authority under the conditions prescribed by NAFM and ASH&VE.



Before you buy power roof exhausters we think you'll agree that these three questions should be answered to your satisfaction. 1. How were the tests conducted? 2. Did it include the whole unit and not a component? 3. What impartial authority conducted the tests? We think that you'll buy Gallaher Air-Vans.

NEW Belt Drive 4000 to 65,000 CFM up to 4 S.P.

Direct Drive 100 to 11,000 CFM up to 4.2 S.P.



Pat. No. 2536290 2188741
Pats. pending

For full information write Dept. V-7

The GALLAHER Company
4108 DODGE STREET OMAHA, NEBRASKA

What Would You Do?

(*Continued from page 95*)

thickness of the slab below the pipe will probably be determined by the requirements of the structural design.

For a moisture barrier below the concrete slab, it is common to use 55 lb. felt roofing material.

While asphalt is sometimes used instead of concrete, proper allowance must be made for its lower heat conductivity. Five and 10-ton rollers have been used to level the asphalt without damage to the piping.

J. E. York
Registered Professional Engineer
South Weymouth, Mass.

The following reply is in answer to a previous problem regarding damage to ducts by a mild sulfurous fume and what may be done to protect the metal surface so as to cut down the frequency of duct replacements.

With reference to the problem discussed in your October issue, a similar situation exists in the operation of a malt drying kiln, when sulfur dioxide is introduced into the drying air stream to bleach the grain. Fan housings and blades exposed to this air exhausted at 160 to 220F have a very short life. A very satisfactory solution to this problem was found in coating the exposed metal with a baked on layer of a resin marketed with the trade name of Heresite.

The surface must first be cleaned by sand blasting, the resin painted on, and then baked at a relatively high temperature. While this treatment is quite expensive, operating experience indicates that the sulfur damage is eliminated.

E. W. Jerger
Professor of Mechanical Engineering
Iowa State College
Ames, Ia.

Plumbing Courses

(*Continued from page 94*)

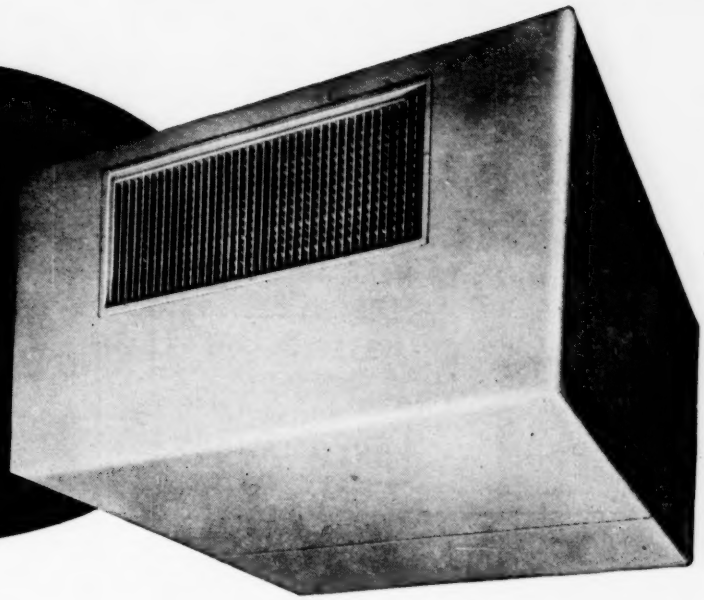
Many of the plumbing courses offered in the vocational schools are designed for plumbing apprentices and also those employed in the trade. They are planned to train the student for the journeyman status. Although some of the work can be completed in one year, most of the courses require two to four years for completion.

In a few cases, schools require a high school education; however, most of them will admit students who have an eighth or ninth grade schooling.

An effort was made to make this tabulation as complete as possible. Omissions of some schools may be due to failure on the part of the school to reply to a request for information or due to the fact that the school was not included in the list to which questionnaires were mailed.

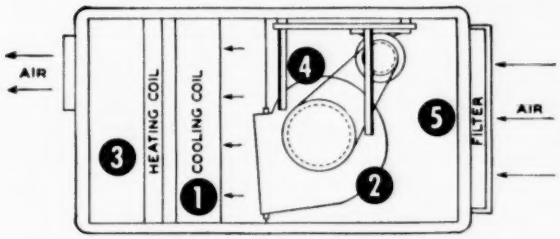
For detailed information regarding any of the courses, write to the school listed for descriptive literature.

NEW FEATURES of PROVEN MERIT



KRAMER

AIR CONDITIONING UNITS



1 MUGGY-AIR-CONTROL

It "squeezes" extra moisture from the air on muggy days without reheating, dampers or excessive cooling. No short cycling and uncomfortable conditions.

2 "BLOW-THROUGH" DESIGN

Fan-motor assembly always exposed to normal room temperatures. A unique design with many advantages, resulting in —

No motor overload and no loss of bearing lubricant from hot air of the heating coils.

No corrosion of fan-scroll assembly from moisture carry-over of the cooling coils.

3 ANTI-SWEAT CONSTRUCTION

Only a small portion of the casing is exposed to cooled air; that section is heavily insulated.

Access doors and grille have scientific anti-sweat designs.

4 QUIET OPERATION

The fans and motor form an integrated assembly independently rubber-mounted to the casing. All moving parts are completely isolated by rubber.

5 FOR FINISHED INTERIORS

Graceful lines with no unsightly belts, motor and guards exposed to view. Finished in hammer gray enamel.

MANY OTHER OUTSTANDING FEATURES.

WRITE FOR BULLETIN AC-238

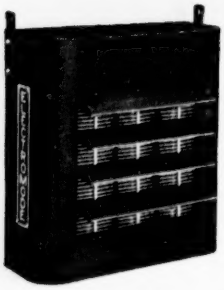
KRAMER TRENTON CO. • Trenton 5, N.J.

HEAT
Where You Need It

HARD-TO-HEAT AREAS

REMOTE LOCATIONS

PROBLEM INSTALLATIONS



MODEL 14-10

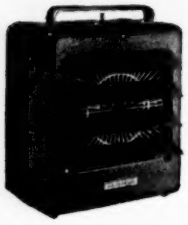
Suspension Type Models, 10,000 to 45,000 watts. For permanent installation where large areas are to be heated and for auxiliary heat in hard-to-heat areas. Adjustable louvers for directing fan-circulated heat where desired.

with **ELECTROMODE** All-Electric

UNIT HEATERS

Models and Capacities To Match Requirements

PLANT • OFFICE WAREHOUSE



MODEL AN-30A

Combination Portable and Suspension Type Models, 1500 to 7500 watts. Smaller heaters may be plugged in temporarily wherever heat is needed or mounted permanently on swivel-type brackets. Adjustable louvers for directing fan-circulated heat where desired.

- Quick, Easy Installation
- No Plumbing Required
- No Wasted Heat
- Satisfied Users
- Nothing to Freeze
- For Utmost Economy can be thermostatically controlled

Completely SAFE!

Only Electromode has the sealed-in CAST-ALUMINUM HEATING ELEMENT. No danger of fire, shock or burn. Automatic safety switch prevents overheating.

Approved by Underwriters' Laboratories

For HOMES • OFFICES MOTELS • STORES

This modern design Electromode Wall-Type Heater has built-in thermostat for individual room temperature control. Fan-circulated heat is distributed by Down-Flo principle—at floor level. Easy to install in new building or remodeling. Handsome silver grey hammertone finish. Available in 1500 to 4000 watts.

MODEL WA

ELECTROMODE CORPORATION, Dept. HV-113
45 CROUCH STREET ROCHESTER 3, N. Y.

Please send free literature on:
☐ Electromode Industrial Heaters
☐ Electromode Domestic Heaters

NAME_____

ADDRESS_____

CITY_____ STATE_____

ABSTRACTS AND REVIEWS

Publications abstracted in this department should be ordered direct from publisher.

REFRIGERATION MANUAL

A completely revised edition of the Trane Refrigeration Manual presents understandable information on the installation, operation and servicing of refrigeration equipment, and is designed to be helpful to contractors and servicemen. First published in 1946, the manual has been used as a text and reference book on refrigeration by colleges.

As compared with the previous edition, this book contains two entirely new chapters on refrigeration piping, a new chapter on refrigeration system control, a revised chapter on service operation and a completely revised refrigeration system service analysis chart.

Included are data covering the selection, installation and servicing of all the component parts of refrigeration systems, including evaporators, compressors, condensers, thermostatic expansion valves, refrigeration system control equipment, motors and motor control equipment, heat exchangers, dryers, valves, piping and accessories.

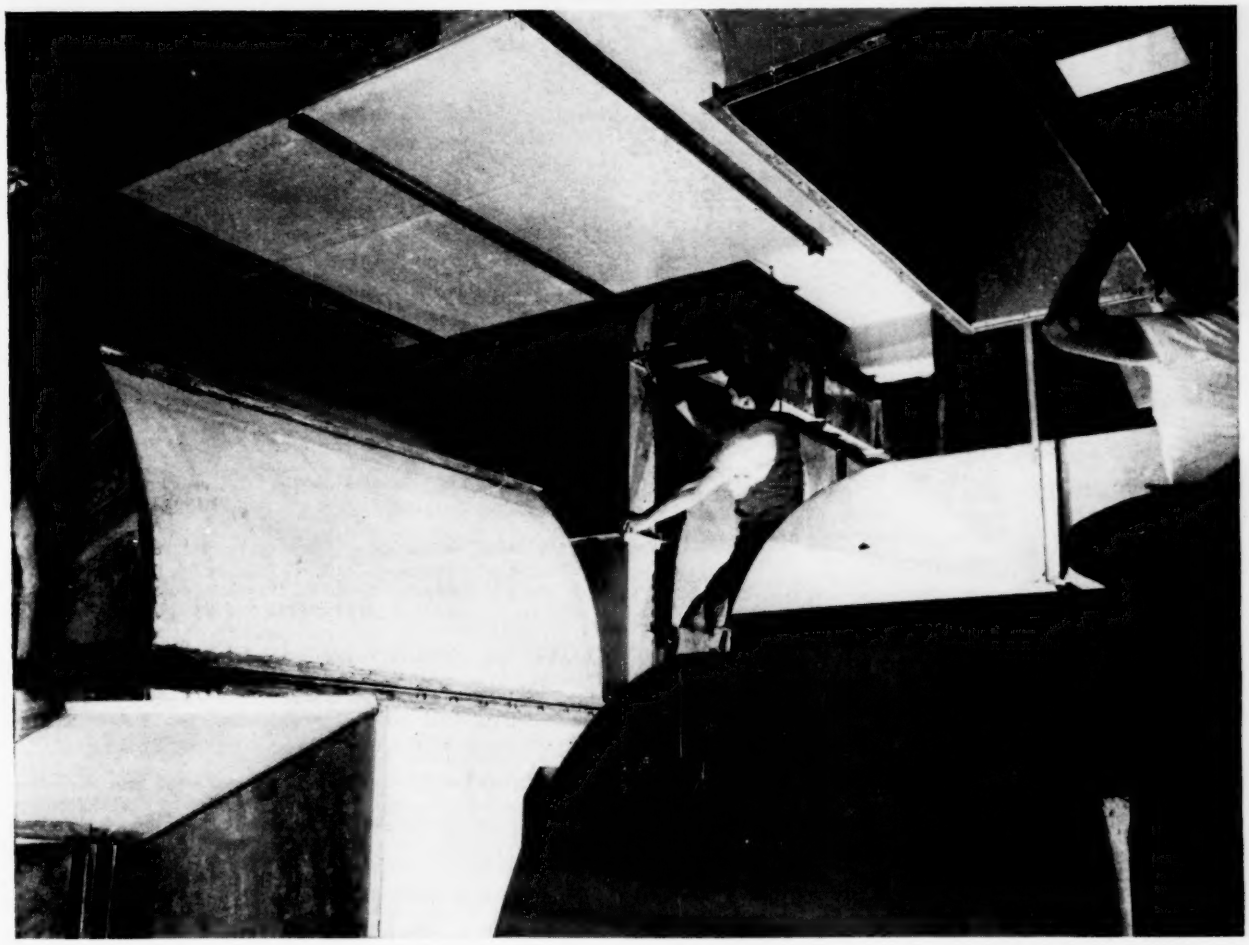
Trane Refrigeration Manual. Spiral bound with paper covers; page size 8¾ x 11 inches, 125 pages. Published by The Trane Company, La Crosse, Wis. Price, $1.50.

• • •

CORROSION OF METALS AND MATERIALS—Report No. 4 has been issued as the final report on studies conducted at Battelle Memorial Institute as a project of the American Gas Association. This report, "The Corrosion of Metals and Materials by the Products of Combustion of Gaseous Fuels," reviews the earlier work presented in three preceding publications and covers in detail the final aspects of the investigation. Various types of operating conditions were checked and ceramic coatings were tested. American Gas Association, 420 Lexington Ave., New York 17, N. Y. Price, $1.

DEGREE DAY DATA—Monthly and seasonal heating degree day data for 200 cities in the United States are being published on the first Wednesday of each month in the U. S. Weather Bureau's "Weekly Weather and Crop Bulletin, National Summary." Subscription price for this publication is $3 per year. Address Superintendent of Documents, Government Printing Office, Washington 25, D. C.

STATIC ELECTRICITY IN HOSPITAL OPERATING SUITES—Conducted by the Bureau of Mines, a study was made to show the prevalence of static electricity in the average hospital anesthetizing area and the degree to which this easily developed electrical form of energy constitutes an explosion hazard. The results of this investigation are given in Bulletin 520, Bureau of Mines, on Static Electricity in Hospital Operating Suites. Not only does this study present results of observations and tests in hospitals, but there is detailed information on safety measures to be followed. Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price, 40 cents.



Galvanized Steel Costs Less than Sheets of Other Metals

Compare steel with any other sheet metal on the basis of equal strength and you will find that it costs substantially less. To equal the strength or stiffness of light-gage steel, other metals must be used in relatively thick and expensive gages.

If you compare steel with other metals on the basis of equal weight, again you will see that steel is less expensive. Pound for pound, no other commonly used sheet metal can match the low cost of steel.

Bethlehem galvanized sheets are made from strong, durable steel, either plain or copper-bearing. They carry a tight, uniform coating of zinc to provide superior corrosion-resistance. They look good. They have excellent workability, and they give a professional finish to any sheet-metal job.

Bethlehem
GALVANIZED
Steel Sheets

★ BETHLEHEM STEEL ★

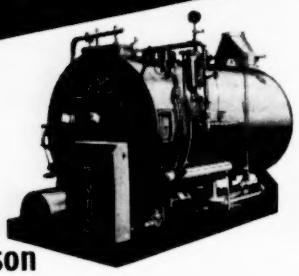
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

For Tishman Realty & Construction Corporation's record-breaking

99 Park Avenue

On the way from Titusville, Pa. to 99 Park Avenue, N. Y. C. These two large Ticosteam Generators were installed by RAISLER CORPORATION the heating contractors.



dependably providing heat for the winter season and summer power for air conditioning

At the heart of New York's most talked-about new building, Tishman's 99 Park Avenue, two modern Titusville Ticosteam package steam generators are on essential duty. Each of these dependable and efficient units has a continuous steam capacity of 15,525 lbs. per hour, peak capacity of 19,300 lbs. per hour, and design pressure of 200 psig. They are fired with heavy oil, using rotary cup burners. ● *Write for TICOSTEAM Bulletin B-3100.*

THE TITUSVILLE IRON WORKS COMPANY

TITUSVILLE, PA.

TITUSVILLE IRON WORKS CO TITUSVILLE, PA.

A division of Strathers Wells

Manufacturers of

A COMPLETE LINE OF BOILERS FOR EVERY HEATING AND POWER REQUIREMENT

COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available.

CONTRACTORS CONVENTION—Annual convention of the Refrigeration & Air Conditioning Contractors Association, at the Carter Hotel, Cleveland, Ohio. Secretary of the Association, 228 N. LaSalle St., Chicago 1, Ill. . . **NOVEMBER 8-11, 1953.**

ALL-INDUSTRY EXPOSITION—8th All-Industry Refrigeration & Air Conditioning Exposition, at the Public Auditorium, Cleveland, Ohio. Geo. E. Mills, show director, 1346 Connecticut Ave., Washington 6, D. C. . . . . **NOVEMBER 9-12, 1953.**

PUBLIC HEALTH MEETING—81st annual meeting of the American Public Health Association and annual sessions of 40 related organizations, at the Hotels Statler and New Yorker, New York, N. Y. Dr. R. M. Atwater, executive secretary of the Association, 1790 Broadway, New York, N. Y. . . . . **NOVEMBER 9-13, 1953**

ASME MEETING—Annual meeting of the American Society of Mechanical Engineers, at the Statler Hotel, New York, N. Y. Secretary of the Society, 29 W. 39th St., New York 18, N. Y. . . . . **NOVEMBER 29-DECEMBER 4, 1953.**

WARM AIR CONVENTION—40th annual convention of the National Warm Air Heating and Air Conditioning Association, at the Hotel Cleveland, Cleveland, Ohio. George Boeddener, managing director of the Association, 145 Public Square, Cleveland 14, Ohio. . . . . **DECEMBER 2-3, 1953.**

ASRE CONVENTION—Annual convention of the American Society of Refrigerating Engineers, Shoreham Hotel, Washington, D. C. Secretary of the Association, M. C. Turpin, 40 W. 40th St., New York, N. Y. . . . . **DECEMBER 6-8, 1953**

AUTOMATIVE ENGINEERS MEETING—Annual meeting and engineering display of the Society of Automotive Engineers, at the Conrad Hilton Hotel, Chicago, Ill. Secretary of the Society, 29 W. 39th St., New York 18, N. Y. . . . . **JANUARY 11-15, 1954.**

ASHVE MEETING—Annual meeting of the American Society of Heating and Ventilating Engineers, at the Rice Hotel, Houston, Tex. A. V. Hutchinson, secretary of the Society, 62 Worth St., New York 13, N. Y. . . . . **JANUARY 25-27, 1954**

PLANT MAINTENANCE & ENGINEERING SHOW—The Plant Maintenance & Engineering Show for 1954 will be held at the International Ampitheatre, Chicago, Ill., concurrently with the Plant Maintenance & Engineering Conference at the Hotel Conrad Hilton, Chicago. Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y. . . . . **JANUARY 25-28, 1954**

WELDING SOCIETY MEETING—1954 National spring technical meeting of the American Welding Society, at the Hotel Statler, Buffalo, N. Y. J. G. McGrath, national secretary of the Society, 33 W. 39th St., New York 18, N. Y. . . . . **MAY 4-7, 1954**

WELDING SOCIETY EXPOSITION—1954 Welding and Allied Industry Exposition of the American Welding Society, at the Buffalo Memorial Auditorium, Buffalo, N. Y. J. G. McGrath, national secretary of the Society, 33 W. 39th St., New York 18, N. Y. . . . . **MAY 5-8, 1954**

GAS APPLIANCE MEETING—Annual meeting of the Gas Appliance Manufacturers Association, at The Drake Hotel, Chicago, Ill. H. Leigh Whitelaw, managing director of the Association, 60 E. 42nd St., New York, N. Y. . . . . **MAY 19-21, 1954.**

INTERNATIONAL INSTRUMENT CONGRESS—First International Instrument Congress and Exposition, sponsored by The Instrument Society of America, to be held in the Commercial Museum and Convention Hall, Philadelphia, Pa. Richard Rimbach, managing director of the Exposition, 921 Ridge Ave., Pittsburgh 12, Pa. . . . . **SEPTEMBER 14-25, 1954.**

HEATING AND VENTILATING'S

Ad-Digest SERVICE

Below and on the following pages are given brief digests of the advertisements appearing in this month's issue. Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail the prepaid postcard to request further information from manufacturers.

NOTE: While every attempt is made to list all advertisements, those which are received after the published closing date may not appear. The Index of Advertisers lists all the advertisements in this issue.

AIR HANDLING EQUIPMENT. Page 26. A new line of air handling equipment including two new heating and ventilating units and a new centrifugal fan unit heater. All have sectionalized construtcion, easy access for serviceability, and long life. Information available. ----------**Item 201**

REMOTE AIR CONDITIONING UNITS. Page 46. For year round air conditioning including summer cooling and winter heating. These cabinets which are fed with well water in summer and hot water in winter have been found to be the answer in a large resort hotel in New York State. Units are recommended for hotels, motels, hospitals, apartments and other multi-room buildings. Brochure available. ----------**Item 202**

DUCT FANS. Page 1. How fumes were exhausted from boiling brass without hoods by using five duct fans of the type where the fan is installed in the duct work and yet out of the way of the fumes. Catalog available. ----------**Item 203**

UNIT HEATERS. Page 2. How down-blow unit heaters were used in a school gymnasium which was steam heated and also equipped with propeller fan unit heaters in locker rooms, manual training rooms and cafeteria kitchen and with convectors in the home economics room, auditorium, corridors and stair landings. Information available. ----------**Item 204**

VIBRATION ISOLATORS. Page 22. Fan bases designed to achieve maximum efficiency in reducing noise and vibration transmitted from fans and air conditioning units. Design is made for each particular installation to meet requirements of that job. ----------**Item 205**

STEEL PIPE. Page 20. With this pipe cutting is clean, fast and easy because the pipe is uniformly round and soft, true to size, even in grain structure, free of inclusions and hard spots. ----------**Item 206**

LIQUID CHILLER. Page 30. How a Texas home is healthfully air conditioned by a system served by a packaged liquid chiller which cools 15 gpm of water from 53 to 45 degrees, thus handling a load of 5 tons. Chiller is installed in conjunction with a hot water boiler and circulates chilled water in the summer and hot water in the winter. Information available. ----**Item 207**

UNIT HEATERS. Page 35. Down flow unit heaters especially recommended for saving heat ordinarily wasted in buildings with high ceilings. Have ripple fin coils. Available in 22 down flow types with four styles of directional air diffusers. ---------**Item 208**

AIR FILTERS. Page 16. Selection of the proper air filter is most important. This company maintains competent field and laboratory engineers to help you determine the best type of filter for your particular problem. Latest filter testing methods assure peak performance. ----------**Item 209**

ELECTRIC MOTORS. Page 21. The hermetic motor is a part of a modern refrigerating unit the user never sees. The fact that it is forgotten is a tribute to its design and construction. This company makes motors in ratings from 1/20 to 5 hp, and hermetic motors from ⅛ to 20 hp. Bulletins available. ----------**Item 210**

TEMPERATURE REGULATORS. Page 36. Three reasons for the accurate regulation of these regulators are the packless construction, large balanced metal diaphragm, and sensitive pilot. Bulletin available. ----------**Item 211**

AIR CONSERVATION. Page 115. A book on air conservation engineering, 76-pages, priced at $5, covers factual information on air recovery as well as practical down-to-earth suggestions in this important field of engineering. Order directly from advertiser. ----------**Item 212**

STEEL BOILERS. Page 118. This company's D type boiler is reported as the best boiler buy for big buildings everywhere. It meets or exceeds ASME Code requirements in all details of construction as certified by a resident Hartford inspector and is S.B.I. rated. Catalog available. ----------**Item 213**

UNIT HEATERS. Page 18-19. A line of steam and hot water units that tops the field. Discharge air temperatures are correctly related to air velocities. Built-in velocity generator steps up heat throw and assures heat penetration of cold air strata near floor. Also made in vertical units. ----------**Item 214**

PIPE INSULATION. Page 32-36. An unusual pipe insulation which installs itself, in that it is poured on underground pipe, tamped and backfilled, and the job is insulated. The heat in the pipe fuses the insulation to the pipe resulting in an underground pipe insulation at low cost. Available in three grades. Literature available. ----------**Item 215**

REFRIGERATION COMPRESSOR. Page 123. How a refrigeration compressor was used to speed up production in a brass mill where coolant chilled by the compressor is pumped over the brass rod before it enters the roll giving increased output, longer life of roll, more uniform finish and cleaner working conditions. ----------**Item 216**

WELDING FITTINGS. Page 25. One of the prime functions of the distributor of these fittings is to maintain local stocks of equipment and supplies. This permits you to operate with reduced inventories and to move quickly to meet changing production needs. ----------**Item 217**

DUST COLLECTING. Page 121. A dust collector equipped with a precleaner which exhausts dust from a brusher, counter-brusher and buffer in a Milwaukee tannery. Although each produces dust in heavy concentration, dust is nowhere in evidence in the plant. Collector uses a wet collection method. Bulletin available. ----------**Item 218**

HOT WATER DRAIN. Page 28. An inexpensive valve, combining vacuum breaker and drain, saves time in draining average size expansion tank in a hot water heating system. ----------**Item 219**

HEATING COILS. Page 146. A steam heating coil with defroster for use in combination with air conditioning coil or as tempering and booster units in long heating ducts. Details available. ----------**Item 220**

PLEASE SEND US MORE INFORMATION.

Circle below item numbers on which you wish further information.

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Circle numbers corresponding to the advertisements in which you are interested, print your name and address clearly. Information will be sent directly from manufacturers.

PLEASE PRINT Nov. H-53

Name ..... **Title** .....

Firm .....

Nature of Firm's Business .....

Street .....

City ..... **Zone**..... **State** .....

This card is void after Feb. 1, 1954

Ad-Digest SERVICE

FLEXIBLE HOSE. Page 138. A line of spiral-wire reinforced hose for fume exhaust, dust or chip collection, ventilation, or movement of materials. Weighs only one-third as much as steel pipe. ...**Item 221**

PACKAGED AIR CONDITIONERS. Page 143. An air conditioning package combining two separate refrigeration circuits, two compressors, two motors, cooling section and evaporative condenser in one central station. In seven sizes, 10 to 50 hp. **Item 222**

WEATHER MODULATED CONTROL. Page 61. Company offers engineering service designed to save you time in planning and installation. Service extends the job right up to actual operation and includes complete installation, drawings, and wiring diagrams. Details available. ...**Item 223**

AIR CONDITIONING DRIVES. Page 58. As an example of the engineering of this company's line of air conditioning equipment the drives are aligned and tested for more efficient operation for longer life. All drives up to 5 hp have variable pitch on motor for adjustment to meet field conditions. ----------**Item 224**

ELECTRIC UNIT HEATERS. Page 145. A line of ceiling mounted electric blower type heaters in capacities from 51,180 to 136,480 Btu per hour. Can be used in connection with air ducts. Catalog available. ----------**Item 225**

AIR FILTERS. Page 139. Line of air filters engineered to the job, offers more effective duct collection. Expanded metal face plate acts as a lint arrestor to provide easier cleaning and servicing, and distributes air easily over entire filter area. Bulletins on request. ----------**Item 226**

FRESH AIR INTAKES. Page 145. Fresh air intakes which supply fresh, filtered air to each room without the expense of costly distribution ducts. Catalog available. ----------**Item 227**

TEMPERATURE REGULATORS. Page 143. Temperature regulators for accurate control of steam heated hot water tanks, vats, preheaters and process tanks. Have hydraulically formed one piece bellows, smaller range spread, stainless steel valve stems and other features. ---------**Item 228**

VALVE AND UNION. Page 147. An all star team with a line-up of a bronze globe valve having renewable composition disc with perfect sealing at all times and a Dart union with round surface and extra wide seating surfaces. Made of bronze, non-corroding on both sides of the seat. ----------**Item 229**

STEAM GENERATORS. Page 56. A steam generator of the horizontal fire-tube type which features two pass design. With this design, need for refractory baffles or partitions in front or rear is eliminated. Boiler has other features as well. Catalog available. ----------**Item 230**

PYROMETER. Page 135. A portable contact pyrometer for taking surface temperatures whether surface is metallic or non-metallic, flat, curve, stationary or revolving. Well balanced and mounted in a sturdy cage. Bulletin available...**Item 231**

STEAM TRAPS. Page 143. The larger orifices in these traps saves in four ways, including giving two to six times average drainage capacity. Smaller traps can be used cutting original investment. Bulletin available. ----------**Item 232**

CORROSION PROOF PIPE. Page 149. A high silicone iron alloy piping which offers extremely high resistance to corrosion at reasonable cost. This resistance is not just on the surface but throughout the pipe wall. Catalog available. ----------**Item 233**

ELECTRIC UNIT HEATERS. Page 132. A line of electric unit heaters for hard to heat areas, remote location and for problem installations. Available in suspension type, combination portable and suspension type and other models. Literature available. ----------**Item 234**

BOILER TUBES. Page 47. Welded boiler tubes with uniform wall thickness, uniform diameter and concentricity. These tubes also have uniform physical properties and characteristics. They give long and faithful service in boilers of all types and pressures. For new boilers or retubing. ----------**Item 235**

RESIDENTIAL COOLING TOWERS. Page 127. A 20-year guarantee on the wetted deck surface is offered on this company's cooling towers which are priced for the home market. These cooling towers are now required in many areas to conserve water. Bulletin available. ---------**Item 236**

POWDER-ACTUATED TOOL. Page 148. Duct work can be anchored to concrete faster with this powder-actuated fastening system. For fastenings, including strap hangers, pipe hangers, conduit clamps, and furring strips and other items which can be fastened to concrete to advantage with this tool. Literature available. ----------**Item 237**

SILVER BRAZING. Page 144. How brass pipe and Flagg fittings were used in a large new hospital and all joined with the low temperature silver brazing alloy. Threads were eliminated by use of this pipe which has one-third the wall thickness of standard pipe. Bulletin available. ----------**Item 238**

WATER LEVEL CONTROL. Page 145. A boiler water level control in which a magnetic sleeve rising and falling within a non-magnetic tube trips or releases a permanent magnet attached to a mercury switch. Has long operating life, requires little servicing, and is easy to adjust in the field. Catalog available. ----------**Item 239**

SPEED CONTROLLER. Page 149. Speed controllers for fan and blowers will fit the speed requirements and load factors of each application. Brochure available. ----------**Item 240**

ROTARY VENTILATORS. Page 149. Rotary ventilators which offer maximum exhaust capacities, superior balance design, and lifetime guaranteed bearings. Information available. ----------**Item 241**

REFRIGERATION MACHINE. Page 128. How a Pittsburgh firm used this line of refrigeration machines for thiry-five years and has found it very dependable. Information available. ----------**Item 242**

STEAM GENERATOR. Page 134. How this steam generator of the packaged type is used in one of New York's most talked about new buildings. They are fired with heavy oil using rotary cup burners. Bulletin available. ----------**Item 243**

UNIT HEATERS. Page 52. A revolving unit heater which keeps the air in constant gentle motion and in which the discharge outlet continually revolves. Consequently, it can also be used in summer to keep workers comfortable on the hottest days. Bulletin available. ----------**Item 244**

AIR CONDITIONING UNITS. Page 131. Air conditioning units with five outstanding features including muggy air control, blow-through design, anti-sweat construction, quiet operation and graceful lines. Bulletin available. ----------**Item 245**

STEAM HEATING COILS. Page 141. These coils assure maximum heat transfer due to features which include heavy aluminum fins, heavy galvanized steel casings and extruded fin collars which entirely surround copper tubes. Catalog available. ----------**Item 246**

HEAT EXCHANGERS. Page 119. An illustrated hook-up for the case where there is a large and constant demand for hot processed water. Hook-up assures constant control of temperatures, pressures and velocities. Heat exchange equipment includes reclaimers, storage heaters, condensate coolers, and booster heaters. Catalog available. ----------**Item 247**

CORROSION-PROOF STRUCTURE. Page 138. Light-weight, corrosion-proof structures such as exhaust systems, ducts, dipping baskets, and tanks made of polyvinyl chloride inert to most acids, salts and alkalies. Manufacturer also furnishes all accessories so that there is no weak link in the corrosion-proof installation. Bulletin available. ----------**Item 248**

ANGLE VALVES. Page 125. A case history of an installation of valves which have been in service for more than thirty-five years in a Colorado mill. The valves have never been out of the line for repairs and have had only routine maintenance. ----------**Item 249**

BLOWER VENTILATORS. Page 142. All aluminum roof ventilators and wall or kitchen exhausters in a variety of sizes. Easy to install, quiet impeller and automatic back draft damper. Catalog available. ----------**Item 250**

Postage Will be paid by Addressee

No Postage Stamp Necessary If Mailed in the U. S.

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 53, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

HEATING AND VENTILATING
148 LAFAYETTE STREET
NEW YORK 13, N. Y.

AD-DIGEST SERVICE

FUEL OIL FILTERS. Page 144. Fuel oil filters save a lot of grief in servicing oil burners. If you keep the fine tank rust out of the fuel line you will have no clogged burner tips. A line made in four models, for all types of installations. ..... **Item 251**

AUTOMATIC SHUTTERS. Page 150. These automatic shutters open more easily and fit more snugly, have felt-silencing pads, and are sensitive to air currents. Available in sizes from 12 to 72 inches square and rectangular. Circular available. ... **Item 252**

BELT DRIVEN FAN. Page 53. How belt driven fans exhaust hot air from a process in a helicopter plant. These fans are suitable for air moving jobs from 4,000 to 50,000 cfm and up to 1 inch pressure. Literature available. ..... **Item 253**

DRY AIR FILTER. Page 48. A new panel type dry air filter with medium of accordian-pleated Dycon synthetic fibers in a thick blanket. Can be cleaned by vacuum or water wash. Features large dust holding capacity, easy maintenance, efficiency, and economy. ..... **Item 254**

DUCT INSULATION. Page 54. A glass duct-insulation which not only cuts heat loss sharply saving fuel, but as a duct-liner reduces sound of motors and blowers. It will not burn, rot or absorb moisture and is verminproof. Folder available. ..... **Item 255**

WELDING FITTINGS. Page 51. This line of seamless, butt-welding pipe fittings was introduced in 1931 and even at that time included not only long and short radius ells, but also full branch and reducing tees, reducers, stub ends, caps and welding neck flanges. This organization started ahead, has kept ahead. See your local distributor. ..... **Item 256**

COPPER WATER TUBE. Page 40. Copper water tube is corrosion resistant, won't clog with rust and always gives a full flow of rust-free water. The water tube and the company's solder-joint fittings are a combination that can't be beat for hot and cold water lines, radiant panel heating and drainage lines. ..... **Item 257**

DIFFUSERS. Page 137. Square and rectangular diffusers to provide draftless air distribution from any location. Have built-in diffusing vanes and come in a wide variety of louvered patterns which provide blows in 1, 2, 3, or 4 directions. Catalog available. ..... **Item 258**

SNOW MELTING. Page 44. A discussion of the market for snow melting systems and the application of steel pipe to such systems. A 32-page booklet on steel pipe snow melting and ice removal systems is available. It includes technical data on design, layout, boiler capacities and other information. ..... **Item 259**

REFRIGERATION SPECIALTIES. Inside back cover. A line of refrigeration valves, driers and strainers which is constantly being improved to retain the confidence of the air conditioning and refrigeration industry. ..... **Item 260**

DAMPER HARDWARE. Page 146. A damper kit which includes the highest quality commercial damper, self-centering bracket, solid construction, corrosion resistant materials, and has other features. Free demonstration available. ..... **Item 261**

AIR FILTERS. Page 136. The filtering efficiency of this filter increases as the dust load is applied. You save one-third in space required, in number of units to be installed and serviced. Cost comparison chart available. ..... **Item 262**

COPPER TUBE. Page 39. Reasons why a heating and plumbing contractor uses this copper tube in such jobs as a state teacher's college includes its ease of handling and bending, fewer number of joints required and uniform high quality. ..... **Item 263**

Circle numbers corresponding to the advertisements in which you are interested, print your name and address clearly. Information will be sent directly from manufacturers.

UNIT HEATERS. Page 55. How a plant can be heated economically when the walls have more glass area than brick. Constantly changing wind and sun load cause a central plant system to overheat and underheat. A case history of a plant of this type which installs 200 unit heaters throughout three large buildings. Bulletins available. ..... **Item 264**

AIR CONDITIONING SYSTEM. Page 146. The lowest price, most versatile central air conditioning system for today's home and which cools, dehumidifies, and filters. Models to fit any size or type of forced air heating system available. ..... **Item 265**

COPPER WATER TUBE. Page 103. Description of a radiant heat installation in Vermont using copper water tube. Reasons why this tube is preferred includes the fact that it is easy to bend, available in handy lengths, can be used with solder or compression fittings and is non-rusting. ..... **Item 266**

PACKAGED BOILER. Page 50. This boiler is your best buy because of its fully water cooled furnace, larger lower drum, simple baffle arrangement and centrifugal fan which operates at low speed and is quiet in operation. Bulletin available. ... **Item 267**

POWER ROOF EXHAUSTER. Page 130. A power roof exhauster with ratings resulting from actual physical tests of the whole unit, not just components. A feature is the patented built in scroll effect which can develop high static pressure. Information available. ..... **Item 268**

WATER HEATER CONTROL. Page 59. Thermostatic devices especially designed for controlling water temperature and available in a wide range of devices including temperature regulators, dial thermometers, water mixers, and self-operating temperature regulators. ..... **Item 269**

COOLING TOWERS. Page 141. Mechanical draft cooling towers establishing new performance standards for noise-free operation because they employ squirrel-cage blowers. Comapny also makes natural draft cooling towers. Bulletin available. ..... **Item 270**

PUMPS. Page 129. This line of pumps could be called the 1,000 line because it includes more than 1,000 types and sizes with various power drives available for your selection. Bulletin available. ..... **Item 271**

BOILER SAFETY. Back cover. Why this company made important advances in boiler feeder design with special features and why it developed and introduced the first Btu rated pressure relief valve. These features are only part of the story. Even more important is the quality to which this manufacturer adheres. Four devices are described and illustrated. ..... **Item 272**

Use this Digest to locate and refer to advertisements appearing in this issue of HEATING AND VENTILATING, then fill out and mail the prepaid postcard to request further information.

AIR CONDITIONING CONTROL. Page 23. How this pneumatic system of control was used in a modern research center in Oklahoma City, with a variety of zones. Experience gained by this company will help you in your temperature and humidity control problems. Information available. ..... **Item 273**

REGISTERS AND GRILLES. Page 142. A line of registers and grilles in a full range of sizes for high velocity air conditioning systems. A number of types are included. Information available. ..... **Item 274**

INDOOR-OUTDOOR CONTROL. Page 147. A control which stretches the capacity of the heating system by eliminating the need of pickup capacity required and by maintaining the proper water temperature so that top capacity is needed only on the few days when low temperatures prevail. Bulletin available ..... **Item 275**

AIR DRYING. Page 135. A method of drying air for a supersonic wind tunnel is described. This method can be used for drying materials or products presenting condensation or moisture damage, protecting moisture sensitive processes and other uses. Information available. ..... **Item 276**

UNIT HEATERS. Page 57. A line of unit heaters of both horizontal and vertical projection types for continuous heat service up to 150 lbs. steam pressure, has rugged arc welded construction which outperforms and outlasts heating elements made of thinner non-ferrous materials. Bulletins available. ..... **Item 277**

WELDED FITTINGS. Page 27. These fittings have ample strength to meet the test of maximum service. The company puts special emphasis on sound metallurgy and advanced facilities. Illustrated is modern tensile testing equipment on which ultimate strength, yield strength, and other properties are carefully measured. ..... **Item 278**

CONDENSATE PUMPS. Page 139. Condensate pumps for low pressure system with capacities from 500 to 10,000 square feet E.D.R. Have low return connection. Selection table included. Bulletin available. ..... **Item 279**

WROUGHT IRON PIPE. Page 7. A brief description of eight large buildings in Dallas, Texas, the earliest of which was built in 1899, the most recent in 1925, and all of which make extensive use of

PLEASE SEND US MORE INFORMATION.

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PLEASE PRINT Nov. H-53

Name ..... **Title** .....

Firm .....

Nature of Firm's Business .....

Street .....

City ..... **Zone** ..... **State** .....

This card is void after Feb. 1, 1954

Ad-Digest SERVICE

wrought iron piping. In each installation the piping is providing long life service at lower cost per year. ----------**Item 280**

EXHAUST VENTILATOR. Page 124. A certified duct exhaust ventilator with a dynamically balanced heavy-duty centrifugal fan. Complete ventilator unit has been tested by an independent laboratory. Available in 138 capacity variations. Bulletin available. ----------**Item 281**

WATER HEATERS. Page 109. Instantaneous water heaters for industry, apartments, hotels, office buildings and other applications, and converters, a type of instantaneous heater with a shorter temperature range for all types of buildings. These heaters have only three parts, shells, tube bundle and cover. Hookups illustrated. Bulletin available. ---------**Item 282**

MOTOR CONTROLS AND DRIVE. Page 12-13. A line of smooth running and quiet operating motors in sizes from ½ hp. up, multiple V-belt drives in the most complete line available, and motor controls to meet every requirement of motor operation through the complete range of motor sizes. Bulletins available. ---------**Item 283**

AIR HEATERS. Page 126. A line of air heaters featuring easy accessibility which increases the usefulness of the unit many times. Built for rugged, dependable service. Step-by-step catalog available. ----------**Item 284**

POWERED ROOF FANS. Page 150. Upblast roof fan or equilateral hooded roof fans for positive dispersal of fumes or as a fresh air supply unit. Catalog available. **Item 285**

FANS. Page 147. Power fixed fans with backward curved blades, and non-overloading characteristics, and squirrel cage fans with low speed characteristics. Both are available in a wide range of sizes. Catalog available. ----------**Item 286**

UNIT HEATERS. Page 138. This company makes a unit heater in steam, hot water or gas models for every heating problem. ----------**Item 287**

REFRIGERANT CONTROLS. Page 117. A complete line of refrigerant controls including four types of thermo expansion valves, four types of solenoid valves, three models of float valves and switches, five models of ammonia controls and three suction line controls. ----------**Item 288**

STEAM HEATING SPECIALTIES. Page 17. The new office building of a large pharmaceutical house which will accommodate over 700 people is equipped with this line of heating specialties which have been used before by this same company. Line features dependability, trouble-free service, completness of line, and national reputation. ----------**Item 289**

VALVES. Page 11. One of a series of advertisements on practical piping layout, this one being for a steam jet refrigeration system and showing the valve recommendations for all points in the line. A complete description and enlarged diagram of this layout is free on request. ----**Item 290**

GAS UNIT HEATERS. Inside front cover. A new line of gas fired unit heaters which are easy to install, simple to operate and maintain. Features include die-formed steel casing, aluminized steel heat exchanger tubes and draft diverter, adjustable louvers, and other features. Catalog available. ----------**Item 291**

CENTRIFUGAL REFRIGERATION. Page 34. A centrifugal refrigeration machine which gives increased efficiency due to the volute design, use of multi-stage steam turbine, flash pre-cooling chamber in the cooler, and the horizontal shell and tube type condensers. Bulletin available. ----------**Item 292**

PACKLESS VALVE. Page 24. Packless valve for steam and hot water heating systems, coffee urns, steam kettles, sterilizers, ovens and similar service and which is packless in fact as well as in name. The metal to metal seal is permanently leakproof. Information available....**Item 293**

GAS-OIL BURNER UNIT. Page 38. A burner unit for oil, gas or gas-oil in combination, which is much more than a burner. It is a complete combustion system including burner, automatic controls, fuel systems and forced draft air supply in a single balanced packaged unit. ----------**Item 294**

PACKAGED AIR CONDITIONERS. Page 37. These units, available in six water cooled models from 2 to 15 hp. and in air cooled models requiring no plumbing in 2 and 3 hp. sizes. Units are shipped completely factory assembled, pre-charged with Freon. ----------**Item 295**

DUCT INSULATION. Page 29. This duct insulation can save up to 50% in time using the wrap and staple method of application. Used as a duct liner, this installation can be applied to the duct at the time they are formed by adhering to the metal before running the metal through the brake and shears. ----------**Item 296**

CAST IRON BOILERS. Page 113. Available in two types, one with steam rating from 675 to 1275 square feet, the other with ratings from 1300 to 2275 square feet. Domestic hot water heating capacity has been increased and built-in tankless or tank type heaters provide large continuous hot water supply. ----------**Item 297**

COAL AS A FUEL. Page 111. How Quaker Oats reduced its steam costs by burning coal the modern way and producing steam at 32 cents per thousand pounds with some operating costs reduced one-half. Information on why bituminous coal is today in most places the lowest cost fuel. ----------**Item 298**

STEAM TRAPS. Page 43. At a magnesium reduction plant at the end of 1½ mile long steam line the steam was not hot and 26 old-type steam traps were replaced with new ones so that there is now only a 15 degree temperature drop from the boiler to the end of the line. A trap selector is available. ----------**Item 299**

AXIAL FLOW FANS. Page 45. How axial flow fans are used for thousands of applications such as those in the Navy. They are smooth in performance, built for endurance and convenient to install. ----------**Item 300**

HEATING PUMPS. Page 42. A duplex heating pump furnished with individual float switches so that each pump may be controlled independently or with automatic alternating switch, so that operation of the two pumps alternates, insuring even wear. Bulletin available. ---------**Item 301**

DIFFUSERS. Page 41. No matter which air conditioning system you use, high velocity or conventional, this company makes a suitable diffuser. Information available. ----------**Item 302**

FANS AND COILS. Page 14-15. Power demands are cut with this combination of centrifugal fans and coils. The horsepower requirements of the fans are unusually low, and the coils with their plate-type fins, offer minimum resistance to air flow. Four of the fifteen reasons why this combination gives top performance are listed. ----------**Item 303**

TEMPERATURE CONTROL. Page 106-107. Sunset magazine in Menlo Park, Calif., has a dream home type of headquarters which is equipped with customized temperature control. The tailor-made installations are designed to fit the needs of the building, whether heating, cooling ventilation or humidity control is involved. Information available. ----------**Item 304**

FUEL OIL HEATERS. Page 142. An indirect gas-fired fuel oil heater which gives any desired oil temperature without use of expensive electric boosters. Applicable to all types of oil-fired apparatus. One heater can serve many burners. Bulletin available. ----------**Item 305**

GAS UNIT HEATERS. Page 60. Attractive self-contained unit heaters which give new freedom and flexibility in laying out heating systems. Also useful for drying, blanketing doorways, and similar applications. Catalog available. ----------**Item 306**

FAN. Page 144. Condensed descriptions of centrifugal fans, steel plate exhausters, propeller fans, roof ventilators, and inlet vane controls. Each available in a wide range of sizes and capacities. Bulletins available. ----------**Item 307**

PNEUMATIC CONTROLS. Page 49. Temperature control apparatus manufactured and the system planned and installed by the same organization. Illustrated are indoor and outdoor controls, room thermostats, submaster thermostats, radiator control valve, coil control valve and convector valve. ----------**Item 308**

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NEW YORK 13, N. Y.

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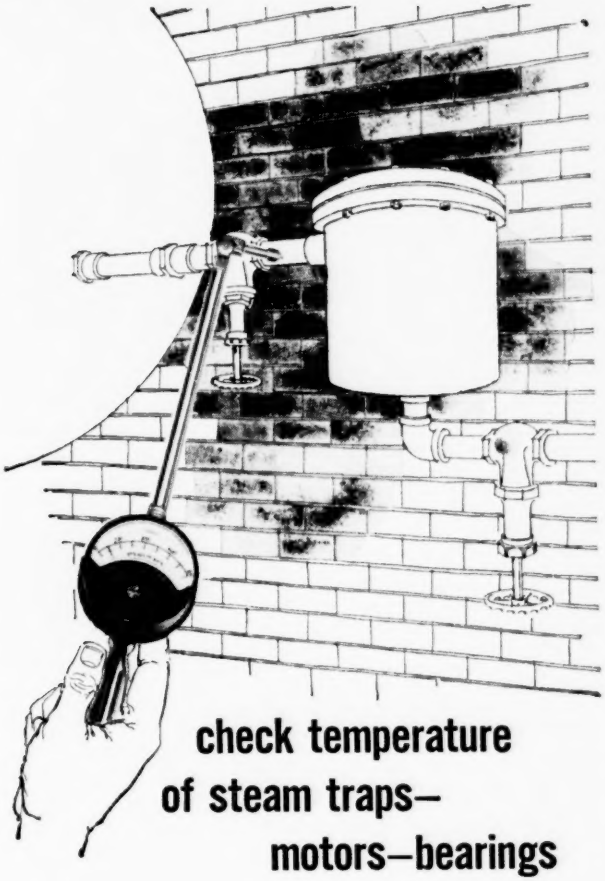

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It's a well-balanced instrument mounted in a sturdy case for protection against the usual hazards of on-the-job service. Jeweled movement is also heavy-duty, shock-resistant type that will withstand hard and continuous use . . . performing with laboratory accuracy.

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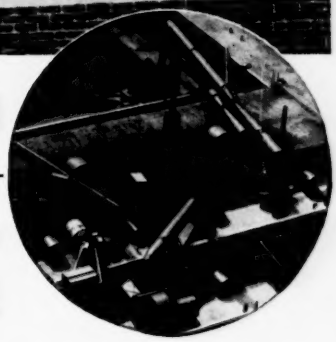

DRY, FRESH -------AIR-------- *For a Supersonic* WIND TUNNEL

● New and improved, this NIAGARA METHOD that effectively dries outdoor air for a wind tunnel used for testing at supersonic speed, can be trusted to give you the best air conditions for your purpose:

- to dry your materials or products
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- to give you exactly the right atmospheric conditions for testing materials
- to put "fresh air" back into your air conditioning, increasing its capacity and effectiveness

The Niagara "fresh air" Method removes the excess moisture from outdoor air by contact with an absorbent liquid in a spray chamber. The liquid contact temperature and the absorbent concentration, both controlled thermostatically, determine the amount of moisture in the conditioned air. Heating or cooling the air is a separate function. Therefore, you can easily and inexpensively have a precisely controlled condition without the use of moisture sensitive instruments.

The Niagara Absorbent Spray Method is noted for solving the really difficult problems of air conditioning. Write for complete information.

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Over 35 Years of Service in Industrial Air Engineering

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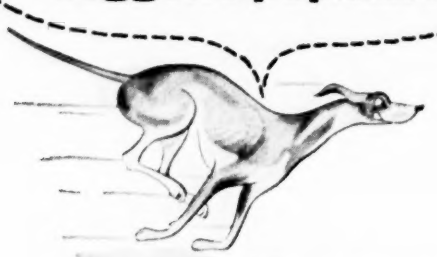
Field Engineers in Principal Cities of U. S. and Canada

Here's why AGITAIR FM AIR FILTERS are so doggone popular!



High velocity...highest efficiency.

⅓ less space required.

Lower installation and maintenance costs.

Long serviceable life.

Designed for an approach velocity of 530 fpm over the net media area, the high filtering efficiency of the AGITAIR FM increases as the dust load is applied. You save ⅓ in space required, in number of units to be installed and serviced. Very large dust-holding capacity of AGITAIR FM assures longer service periods, fewer cleanings per year, lower service charges. No exposed wire ends to cut or damage hands of service operators. Compare. Send today for **free** Cost Comparison Chart.

AIR DEVICES INC.
185 Madison Avenue, New York 16, N. Y.

FILTERS • AIR DIFFUSERS • EXHAUSTERS

DEGREE-DAYS FOR SEPTEMBER, 1953

(A) Airport readings; (C) city office readings; (O) Readings at a point on outskirts of city.

HEATING AND VENTILATING'S 26th Year of Publication of Monthly Degree-Day Data

City	September		
	1953	1952	Normal
Abilene, Texas (A)	0	4	5
Albany, New York (A)	165	130	139
Albuquerque, New Mexico (A)	0	13	10
Alpena, Michigan (C)	237	183	215
Anaconda, Montana (C)	(a)	131	335*
Asheville, North Carolina (C)	51	38	50
Atlanta, Georgia (C)	10	0	8
Atlantic City, New Jersey (C)	26	12	29
Augusta, Georgia (A)	0	0	0
Baltimore, Maryland (C)	28	8	29
Billings, Montana (A)	112	75	194
Binghamton, New York (C)	139	103	141
Birmingham, Alabama (A)	1	1	13
Bismarck, North Dakota (A)	205	146	222*
Block Island, Rhode Island (A)	60	64	88
Boise, Idaho (A)	14	63	135
Boston, Massachusetts (A)	71	62	77
Bozeman, Montana (C)	(a)	200	336*
Buffalo, New York (A)	137	123	122
Burlington, Iowa (A)	68	81	83
Burlington, Vermont (A)	199	143	172
Butte, Montana (C)	(a)	208	344*
Cairo Illinois (C)	4	4	28
Charleston, South Carolina (C)	0	0	0
Charlotte, North Carolina (C)	13	6	7
Chattanooga, Tennessee (A)	11	8	24
Cheyenne, Wyoming (A)	139	150	241
Chicago, Illinois (C)	58	56	76*
Cincinnati, Ohio (C)	16	22	42
Cleveland, Ohio (A)	92	79	75
Columbia, Missouri (A)	25	51	62
Columbia, South Carolina (C)	1	0	0
Columbus, Ohio (C)	45	55	59
Concord, New Hampshire (A)	190	151	192
Concordia, Kansas (C)	15	29	55
Dallas, Texas (A)	0	0	0
Dayton, Ohio (A)	63	69	74
Deer Lodge, Montana (C)	(a)	287	399*
Denver, Colorado (C)	47	68	120
Des Moines, Iowa (A)	66	77	99
Detroit, Michigan (A)	108	95	96
Devils Lake, North Dakota (C)	266	207	276
Dodge City, Kansas (A)	16	25	40
Dubuque, Iowa (C)	150	153	149
Duluth, Minnesota (C)	309	281	277
Eastport, Maine (A)	(a)	220	261
Elkins, West Virginia (A)	159	158	122
El Paso, Texas (A)	0	0	0
Ely, Nevada (A)	160	176	288
Erie, Pennsylvania (C)		85	86
Escanaba, Michigan (C)	222	243	247
Evansville, Indiana (A)	23	39	59
Fargo, North Dakota (A)	214	166	215
Fort Smith, Arkansas (A)	4	3	9
Fort Wayne, Indiana (A)	109	109	107
Fort Worth, Texas (A)	0	0	0
Fresno, California (A)	0	16	0
Galveston, Texas (C)	0	0	0
Grand Junction, Colorado (A)	2	14	36
Grand Rapids, Michigan (A)	161	127	144
Green Bay, Wisconsin (C)	203	213	183
Greensboro, North Carolina (A)	24	21	29
Greenville, South Carolina (A)	13	0	10
Harrisburg, Pennsylvania (A)	66	48	69
Hartford, Connecticut (A)	99	73	101
Hatteras, North Carolina (C)	0	0	0
Havre, Montana (C)	168	122	270
Helena, Montana (A)	184	174	320
Houston, Texas (C)	0	0	0
Huron, South Dakota (A)	130	118	149
Indianapolis, Indiana (A)	56	73	79
Jackson, Mississippi (A)	0	0	0
Kansas City, Missouri (A)	13	25	44
Knoxville, Tennessee (A)	6	3	33
La Crosse, Wisconsin (A)	129	133	152
Lander, Wyoming (A)	120	95	244
Lansing, Michigan (A)	169	156	140
Lewiston, Maine (O)	229	151	165*
Lincoln, Nebraska (C)	39	41	79
Little Rock, Arkansas (A)	0	2	10

City	September		
	1953	1952	Normal
Livingston, Montana (C)	(a)	123	227*
Los Angeles, California (C)	2	0	17
Louisville, Kentucky (A)	21	31	51
Lynchburg, Virginia (A)	40	42	49
Macon, Georgia (A)	0	0	0
Madison, Wisconsin (C)	136	127	137
Marquette, Michigan (C)	253	215	236
Memphis, Tennessee (A)	3	4	17
Meridian, Mississippi (A)	0	0	0
Milwaukee, Wisconsin (A)	123	126	134
Minneapolis, Minnesota (A)	139	143	157
Moline, Illinois (A)	95	97	96
Montgomery, Alabama (A)	0	0	0
Nantucket, Massachusetts (A)	93	113	111
Nashville, Tennessee (A)	6	11	22
New Haven, Connecticut (A)	80	68	93
New Orleans, Louisiana (C)	0	0	0
New York, New York (C)	39	13	39
Newark, New Jersey (A)	45	22	47
Norfolk, Virginia (C)	7	0	9
North Head, Washington (C)	(a)	233	234
North Platte, Nebraska (A)	101	92	120
Oak Ridge, Tennessee (C)	16	(a)	(a)
Oakland, California (C)	32	25	76
Oklahoma City, Oklahoma (C)	0	4	12
Omaha, Nebraska (A)	40	60	88
Parkersburg, West Virginia (C)	50	54	56
Peoria, Illinois (A)	62	80	86
Philadelphia, Pennsylvania (C)	29	10	33
Phoenix, Arizona (C)	0	0	0
Pittsburgh, Pennsylvania (C)	57	38	56
Pittsfield, Massachusetts (A)	226	(a)	213
Pocatello, Idaho (A)	87	85	183
Portland, Maine (A)	226	185	199
Portland, Oregon (C)	60	49	85
Providence, Rhode Island (A)	118	69	107
Pueblo, Colorado (A)	29	53	74
Raleigh, North Carolina (C)	7	7	10
Rapid City, South Dakota (A)	109	74	193
Reading, Pennsylvania (C)	53	32	57
Red Bluff, California (A)	0	7	0
Reno, Nevada (A)	67	107	165
Richmond, Virginia (C)	28	11	33
Rochester, New York (A)	152	109	133
Roswell, New Mexico (A)	0	14	8
Sacramento, California (C)	0	11	17
St. Joseph, Missouri (A)	27	40	49
St. Louis, Missouri (C)	19	10	38
Salt Lake City, Utah (A)	28	36	88
San Antonio, Texas (A)	0	0	0
San Diego, California (A)	3	1	24
Sandusky, Ohio (C)	71	74	66
San Francisco, California (C)	88	128	110
Sault Ste. Marie, Michigan (A)	333	249	298
Savannah, Georgia (A)	0	0	0
Scranton, Pennsylvania (C)	117	94	115
Seattle, Washington (C)	104	88	134
Sheridan, Wyoming (A)	139	111	239
Shreveport, Louisiana (A)	0	0	0
Sioux City, Iowa (A)	91	84	128
Spokane, Washington (A)	149	100	205
Springfield, Illinois (C)	31	32	56
Springfield, Missouri (A)	13	35	61
Syracuse, New York (A)	134	103	117
Tacoma, Washington (C)	(a)	139	177
Terre Haute, Indiana (A)	54	77	77
Toledo, Ohio (A)	109	94	102
Topeka, Kansas (C)	14	25	42
Trenton, New Jersey (C)	54	29	55
Tulsa, Oklahoma (A)	1	(a)	18
Utica, New York (O)	165	108	182*
Valentine, Nebraska (C)	107	101	145
Walla Walla, Washington (C)	36	34	93
Washington, D. C. (C)	28	14	0*
Wichita, Kansas (A)	9	15	32
Williston, North Dakota (C)	220	151	261
Winnemucca, Nevada (C)	100	136	180
Yakima, Washington (A)	142	80	150

(a) Data not available.

*Same normal figures as previously listed by HEATING AND VENTILATING since new figures are not available. All other normal figures in this table are based on a 30-year period covering 1921 to 1950, inclusive, recently compiled and published by the U. S. Weather Bureau.

Figures in this table, with seven exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y.; and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively; Anaconda, Bozeman, Butte, Deer Lodge and Livingston, Mont., through the courtesy of the Montana Power Company.

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You can give free rein to your creative planning and still rely on AGITAIR square and rectangular diffusers to provide draftless air distribution from any location. Custom-designed, with built-in diffusing vanes, in a wide variety of louvered patterns, they provide blows in 1, 2, 3 or 4 directions without use of blank-offs. AGITAIR diffusers need not be centrally located in an area if such placing does not agree with the decorative motif, or if a beam or other obstruction is in the way.

Moreover, AGITAIR square and rectangular diffusers are now available with or without removable, interchangeable cores. AGITAIR also brings you Stripline, the slender, continuous air diffuser with unlimited application versatility.

New 34-page Type R Catalog reveals how correct air distribution is simplified by AGITAIR. Contact your local AGITAIR representative, or write us direct for your free copy.

AIR DEVICES INC.
185 Madison Avenue, New York 16, N. Y.

AIR DIFFUSERS • FILTERS • EXHAUSTERS

NEED A LIGHT WEIGHT, CORROSION-PROOF STRUCTURE?

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...DUCTS

...DIPPING BASKETS

...TANKS

AMPCOFLEX is both a corrosion-proof and self-supporting material that provides extraordinary service under adverse plant and processing conditions. It is an unplasticized, rigid polyvinyl chloride, inert to most acids, salts, alkalies, and standard pickling and plating solutions.

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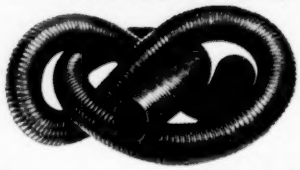
FOR COMPLETE DATA, write for Bulletin 9-1.

ATLAS MINERAL PRODUCTS CO.
MERTZTOWN, PENNSYLVANIA

... self-supporting, corrosion-proof structures

ATLAS Ampcoflex FABRICATIONS

CUT COST with FLEXAUST*



SIZES 1¼ in. ID to 36 in. ID

the high-quality spiral-wire reinforced hose *for* **Fume exhaust, Dust or chip collection, Ventilation, Movement of materials**

FLEXAUST enables you to cut hose costs because it's:

EASY TO INSTALL – Anyone can install FLEXAUST quickly.

DURABLE – Highly resistant to abrasion, aging, corrosion, moisture, chemical deterioration, flexing fatigue.

LIGHT – Weighs only ⅓ as much as comparable metal pipe.

HIGHLY FLEXIBLE – Maintains large sections on sharp bends; no kinking, no flattening.

STRONG – Bonded, double ply, double overlap construction.

AIRTIGHT – Ideal for either pressure or suction.

For details on sizes, coatings, accessories, flow characteristics, write for Catalog 35.

*Trade-marks

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Formerly American Ventilating Hose Co.

FLEXAUST* **PORTOVENT** **BLOFLEX***

There's a **HERMAN NELSON UNIT HEATER**

steam—hot water—gas

to solve your heating problem

For some "HOT NEWS" on these new heaters write to:

American Air Filter
COMPANY, INC.

215 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

LOW PRESSURE SYSTEM *Condensate Pumps*

SINGLE UNIT—Fig. 302A
10 Gal. Receiver for Single Units
Diameter 21"
Hgt. of Return above floor 6⅞"

Capacities 500 to 10,000 sq. ft. E.D.R.

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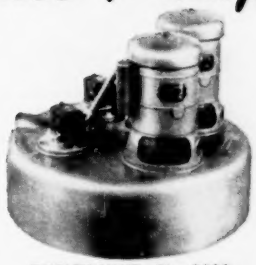
LOW RETURN CONNECTION
LOW SPEED, LONG LIFE
CAST IRON RECEIVER
LOW WATER LINE
ELECTRODE OR FLOAT SWITCH CONTROL



DUPLEX UNIT—Fig. 303B
15 Gal. Receiver for Single or Duplex Units
Diameter 25½"
Hgt. of Return above floor 7 3/16"

TVC SELECTION TABLE

Unit Number	Max. Sq. Ft. E.D.R.	Discharge Pressure At Pump	G.P.M. From Radiation	Cap. of Pump	H.P. of Motor	Return Inlet	Pump Discharge	Dia. of Receiver	Height of Unit
TVC 13	500	20 lbs.	.25	1.0 GPM	1/4	2"	1"	21"	21"
TVC 19	750	20 lbs.	.38	1.5 GPM	1/4	2"	1"	21"	21"
TVC 23	1000	20 lbs.	.5	1.5 GPM	1/4	2"	1"	21"	21"
TVC 29	2000	20 lbs.	1.0	3.0 GPM	1/4	2"	1"	21"	21"
TVC 35	4000	20 lbs.	2.0	6.0 GPM	1/4	2"	1"	21"	21"
TVC 41	6000	20 lbs.	3.0	9.0 GPM	1/2	2"	1"	21"	23½"
TVC 47	8000	20 lbs.	4.0	12.0 GPM	1/2	2"	1"	25½"	23½"
TVC 52	10000	20 lbs.	5.0	15.0 GPM	3/4	2"	1"	25½"	27½"

See Bulletin TVC-300-C for Full Specifications

Intermediate Sizes Based Upon Discharge Pressure Required Are Available.

weil PUMP CO. 1516 NORTH FREMONT ST., CHICAGO 22

ONE doesn't fit ALL needs!

Get *Airsan* Filters
ENGINEERED TO FIT THE JOB — RIGHT EVERY TIME

No filter does *all* jobs, meets *every* need. That's why Airsan Filters are engineered to the job to offer more effective dust collection. Airsan's expanded metal face plate acts as a lint arrestor to provide easier cleaning and servicing. It distributes air easily over the entire filter area. Provide high filtering efficiency and dust holding capacity with less resistance. Features include all galvanized construction and full bronze welded corners. Write for data.

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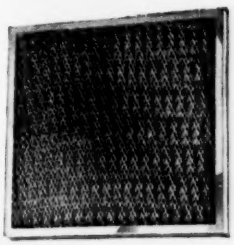
(Low Velocity)

Viscous type, permanent and cleanable designed for industrial, commercial and domestic use. Available in 1" and 2" thickness.



VIRO-CRIMP
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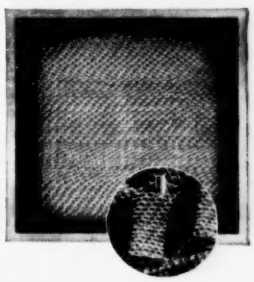
Has a specially designed high velocity Viro-Crimp filter core. Hemmed edges provide a safety feature. Operates efficiently at 300 to 500 fpm. Available in 2" and 4" thickness.



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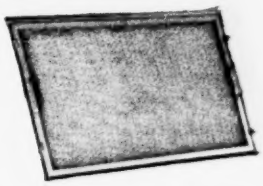

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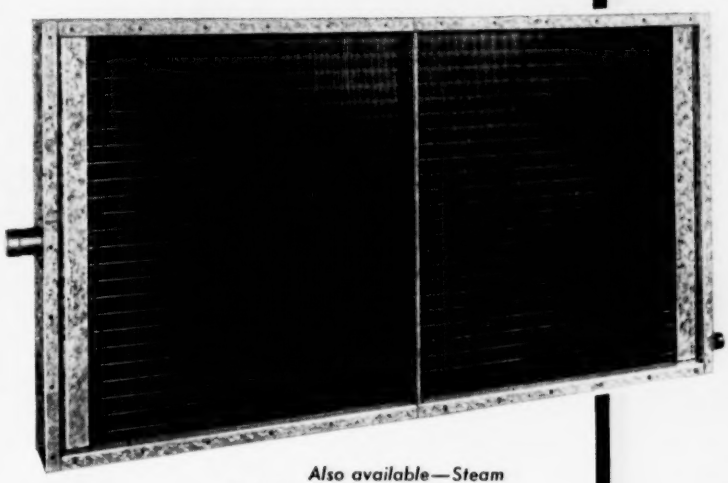

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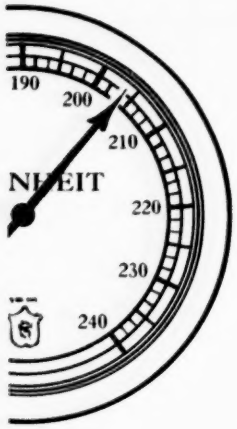

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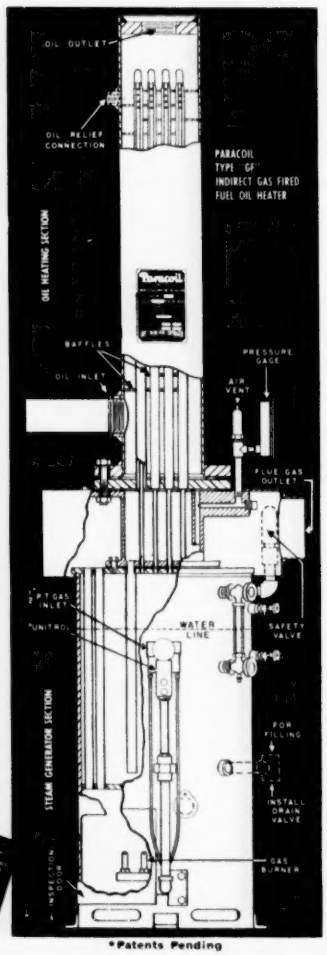

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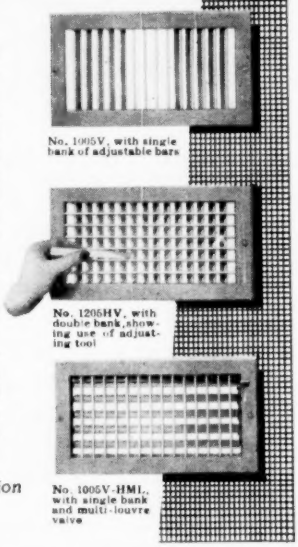

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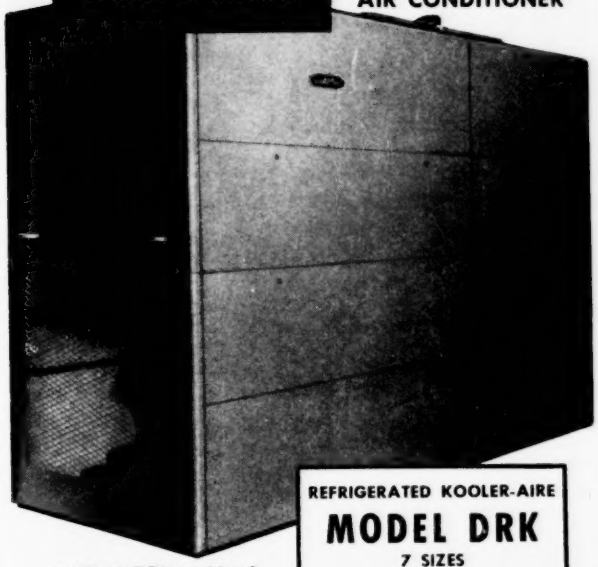

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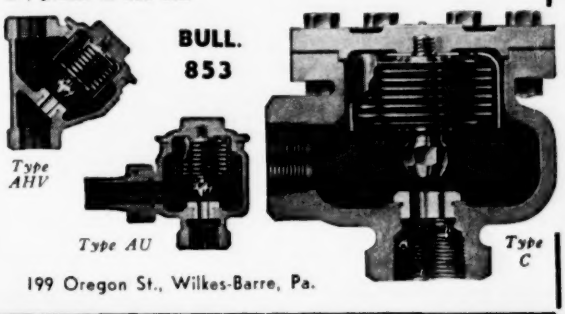

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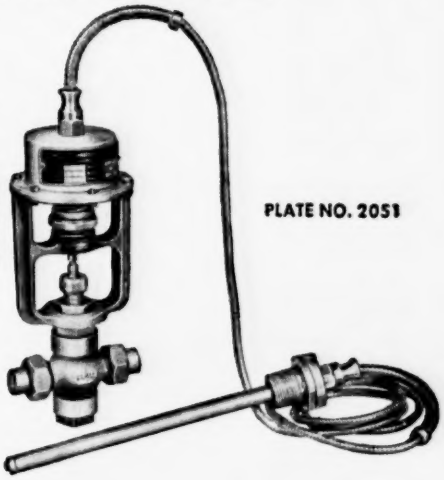

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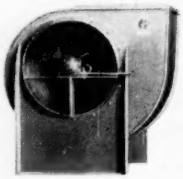

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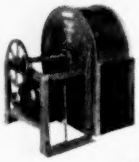

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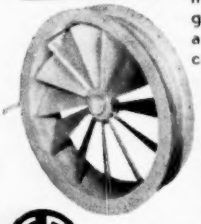

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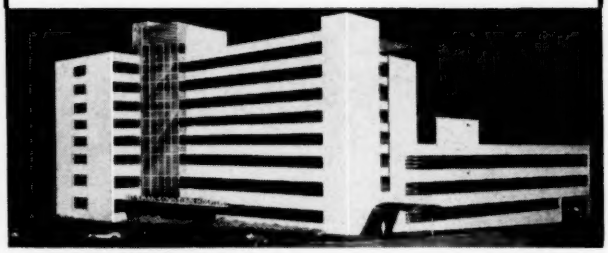

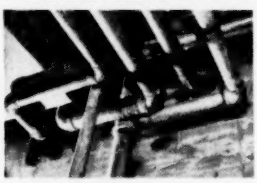

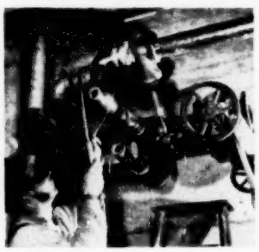

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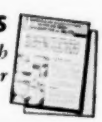

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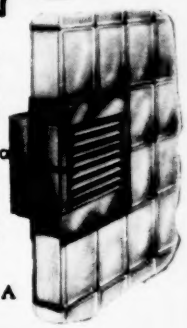

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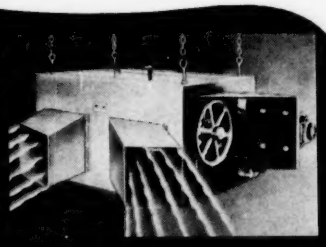

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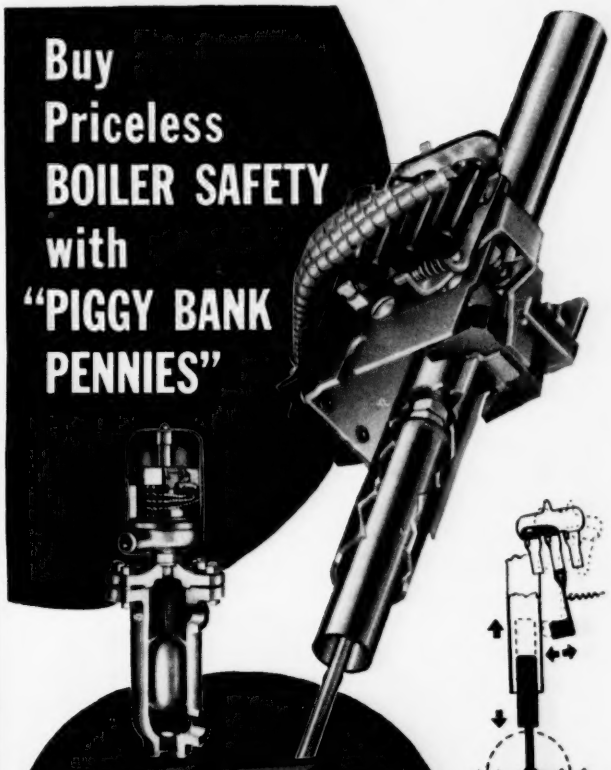

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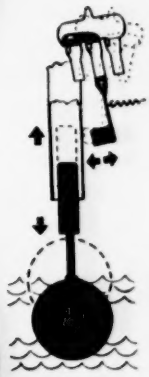

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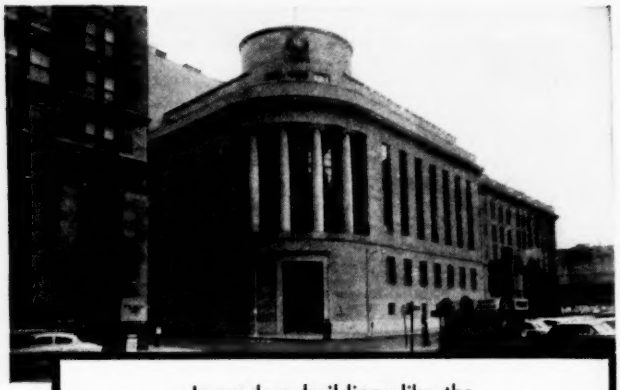

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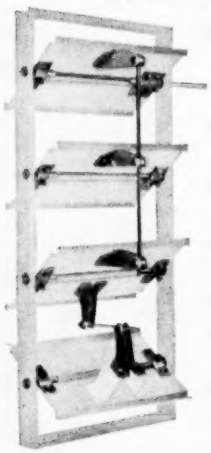

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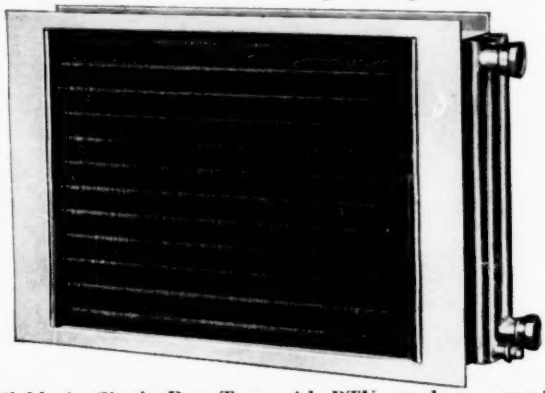

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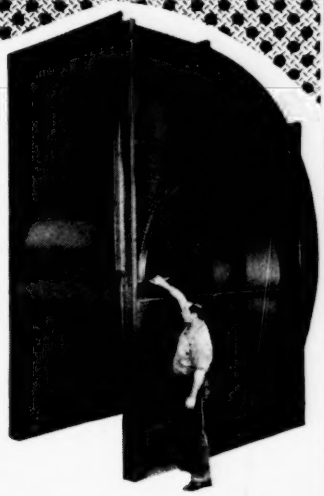

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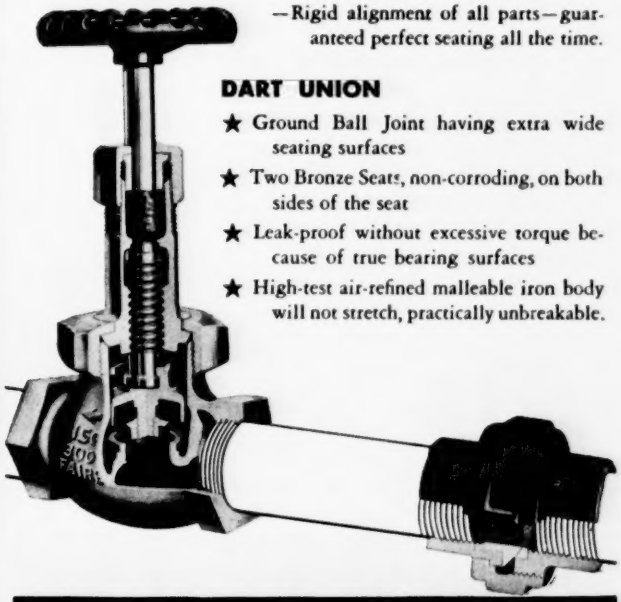

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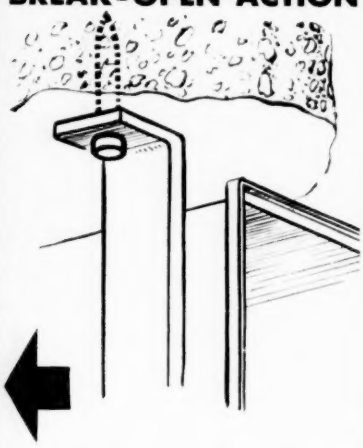

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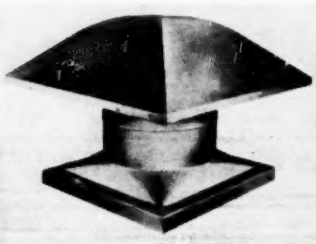

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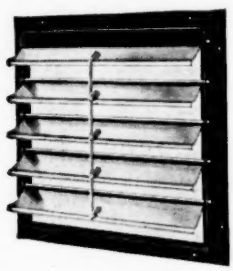

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SIZING GAS PIPING

The accompanying tables are for determining the capacity of a wide range of pipe sizes carrying natural or manufactured gas, and are particularly intended for sizing gas piping in and around building projects. The data are calculated from the Spitzglass formula:

$$Q = 3550 \left(\frac{D^5 h}{(1 + 3.6/D + .03D)\ SL} \right)^{1/2}$$

where Q = gas flow, cubic feet per hour,
D = actual inside diameter of pipe, inches,
h = pressure drop, inches of water, over length L,
L = length of pipe in feet,
S = specific gravity of gas.

Table 1 is a tabular solution of this formula for the case where S = 0.65 and h = 0.2. Tables 2, 3 and 4 are multipliers for correcting to other conditions. The values in the body of Table 1 are multiplied by the multipliers in Tables 2 and 3 to correct for values of *S* and *h* other than 0.65 and 0.2.

The pressure drop *h* in all cases is for the length given, and is *not* the drop per 100 feet. A value of 0.2 is recommended for horizontal, 0.5 for vertical piping.

The purpose of Table 4 is to find the conversion factor to use for values of *L* other than those in Table 1. The multiplier is to be applied to the value of Q in Table 1. Then determine *X*, which is the value of *L* desired divided by the value of *L* used in determining Q. For example, Table 1 does not give *Q* for an *L* of 1000 feet. In this case use the value of *Q* for 500 feet and X is then 1000/500 = 2, and the value of *Q* from Table 1 is multiplied by .707.

Other examples follow.

Example. A horizontal line 60 feet long carrying gas with a specific gravity of 0.65 is to carry 450 cu ft per hour. What size pipe will be needed?

Solution. Table 1 can be used directly, since it applies to horizontal pipe and to 0.65 sp. gr. gas. Opposite 60 feet in Table 1, find 460 as the next larger capacity to 450 cfh. This indicates a 1½ inch pipe.

Example. What size pipe will be needed for 280 cubic feet of gas having a specific gravity of 0.80 of hour flowing through a horizontal pipe 125 feet long?

Solution. From Table 2 find the multiplier for 0.80 gas to be 0.901. Opposite 200 in Table 1 find 510 for 2 inch pipe; 0.901 × 510 = 459.5 cubic feet per hour for a 2 inch pipe. The next smaller pipe

TABLE 1.—CAPACITY OF HORIZONTAL GAS PIPING IN CUBIC FEET PER HOUR

(Figures are for pressure drop of 0.2 in. of water and gas of 0.65 specific gravity)

Length of Line in Feet	Nominal Pipe Diameter, Inches										
	½	¾	1	1¼	1½	2	2½	3	3½	4	5
	Capacity, Cubic Feet per Hour										
10	72	164	329	724	1123	2270	3720	6750	10050	14200	25800
20	52	117	235	519	802	1623	2660	4845	7170	10130	18450
25	46	104	210	461	715	1450	2375	4310	6400	9050	16450
30	42	95	189	416	645	1305	2140	3900	5770	8160	14880
35	39	88	177	390	605	1220	2000	3650	5410	7650	13900
40	36	83	165	364	565	1130	1870	3400	5050	7150	13000
45	34	78	156	344	534	1080	1770	3220	4770	6750	12250
50	33	74	148	326	506	1025	1680	3060	4520	6400	11630
60	30	67	135	298	460	930	1530	2780	4120	5820	10600
70	28	63	125	276	429	865	1420	2580	3840	5410	9850
80	26	59	117	258	400	810	1330	2420	3580	5060	9200
90	24	55	110	243	377	760	1250	2280	3380	4760	8660
100	23	52	104	230	358	725	1185	2160	3200	4520	8210
125	21	47	94	206	320	645	1060	1930	2860	4050	7350
150	19	43	85	189	294	590	970	1770	2620	3700	6750
200	16	37	74	163	252	510	835	1520	2260	3200	5800
300	14	31	62	136	212	425	700	1280	1890	2680	4850
400	11	26	52	116	179	360	595	1080	1600	2260	4110
500	10	23	47	103	160	323	530	963	1430	2020	3670

TABLE 2.—CONVERSION FACTORS FOR SPECIFIC GRAVITIES OTHER THAN 0.65

(Use 0.65 for natural and water gas, 0.45 for oil and coal gas)

Sp. Gr.	Multiplier	Sp. Gr.	Multiplier
0.30	1.470	0.60	1.040
0.35	1.362	0.65	1.000
0.40	1.275	0.70	0.964
0.45	1.202	0.75	0.931
0.50	1.140	0.80	0.901
0.55	1.088	0.85	0.874

(1½ in) has a capacity of 252 × 0.901, obviously under the given load. A 2 inch pipe should be used.

Example. 127 cubic feet per hour of 0.65 gas is to be fed through a 40 foot vertical pipe. What size pipe is needed?

Solution. Vertical pipe is to be allowed a 0.5 inch pressure drop. From Table 3, the multiplier for 0.5 is 1.581. Opposite 40 in Table 1 find 83 for ¾ inch pipe. Multiply 83 by 1.581 and find 131.2 cubic feet, safely over the 127 required. Use a ¾ inch pipe.

TABLE 3.—CONVERSION FACTORS FOR PRESSURE DROP OTHER THAN 0.2

(Table 1 is based on 0.2 pressure drop, horizontal pipes. Use 0.5 for vertical pipes)

Pr. Drop	Multiplier	Pr. Drop	Multiplier
1.00	2.236	0.40	1.414
0.90	2.121	0.35	1.323
0.80	2.000	0.30	1.225
0.70	1.871	0.25	1.118
0.60	1.732	0.20	1.000
0.50	1.581	0.10	0.707

Example. How much gas could be transmitted through 200 feet of horizontal 1 inch pipe, pressure drop 0.2 inches, specific gravity 0.65, assuming that Table 1 did not show that length, but does show that for 40 feet of 1 inch pipe the capacity is 165 cu ft per hour?

Solution. Divide 200 by 40 and find X to be 5. From Table 4, for X = 5 find the multiplier to be .447. Multiply 165 by .447 and find 73.75, or 74. (This checks with the figure given opposite 200 for 1 inch pipe.)

Example. What would be the capacity of a 110 foot long 1¼ inch gas pipe with 0.45 specific gravity gas and a pressure drop of 0.35 inches?

Solution. From Table 1 find the capacity of a 100 foot 1¼ inch pipe to be 230 cu ft per hour at 0.65 specific gravity and 0.2 inches pressure drop. From Table 2, for 0.45 specific gravity the multiplier is 1.202. From Table 3 for 0.35 pressure drop the multiplier is 1.323. Since 110 feet is 1.1 times 100 feet, find the multiplier for 1.1 to be .953. Therefore, the capacity is

230 × 1.202 × 1.323 × 0.953 = 348.6 cu ft per hour.

TABLE 4.—CONVERSION FACTORS FOR LENGTHS OTHER THAN GIVEN

(X = Length of pipe being designed ÷ length given in Table 1 for Q)

X	Multiplier	X	Multiplier	X	Multiplier
1.0	1.000	1.7	.767	6	.408
1.1	.953	1.8	.745	7	.378
1.2	.913	1.9	.725	8	.354
1.3	.877	2	.707	9	.333
1.4	.845	3	.577	10	.316
1.5	.817	4	.500	20	.224
1.6	.791	5	.447	30	.182

Every Henry Valve, Drier and Strainer
is constantly being improved to retain
the confidence of the Air Conditioning
and Refrigeration Industry in the
complete line of Henry products.

HENRY

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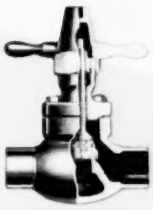
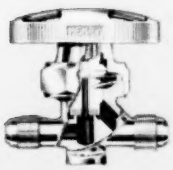
Relief Valve



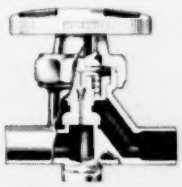
Wing Cap Valve

Drier

Ammonia Valve

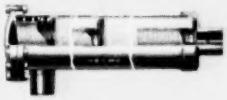


Packless Valve With
Balanced-Action
Blue Bantam Type



Packless Valve With
Balanced-Action
Standard Type

"Y" Strainer



Angle Type Drier

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SINCE 1914

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BOOTH 637
8th ALL-INDUSTRY REFRIGERATION
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The home owner depends upon you to provide the utmost in boiler safety. When you consider the magnitude of this responsibility . . . then is when you realize that in boiler safety devices only the best is good enough.

From the day we began the manufacture of boiler safety devices we have respected this. To deliver in full measure we have had to find the means of combating all the conditions that war against dependable performance of boiler safety devices.

That is why we developed all the important advances in boiler feeder design—the "cool feed valve"; the "Quick Hook Up"; the double Sylphon construction; the stainless steel valve-needle and seat; the deep sediment, chamber; the roller and rocker straight-thrust valve action; the built-in strainer; the powerful snap-action switch; the straight-through, large capacity blow-off valve.

That is also why we developed and introduced the first Btu-rated pressure relief valves.

But the features we pioneered are only a part of the story. Even more boldly in the McDonnell picture is uncompromising *Quality*. It is the quality that results from unswerving adherence to the good old fashioned precept of using only the best in the best possible way . . . regardless of cost.

When you install McDonnell Boiler Water Level Controls you install the ultimate in quality—in dependability. You have the satisfaction of knowing that you have given your customer the best there is!

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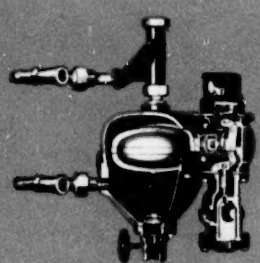
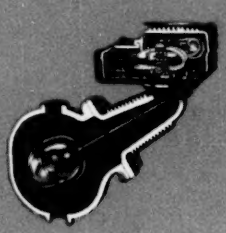
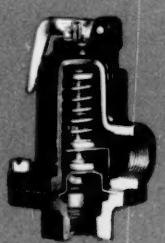


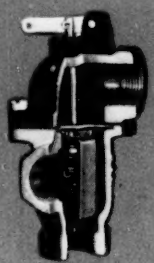
Safety for steam heating boilers up to 5000 sq. ft. capacity, maximum pressure, 25 lbs. . . . No. 47-2 Feeder Cut-off Combination.



Safety for higher pressure steam boilers, any size, maximum pressure 150 lbs. . . . No. 150 pump control, low water cut-off and low water alarm.



Safety for hot water space heating boilers . . . No. 230 series pressure relief valves; opening pressure, 30 lbs.; for all boilers up to 2,000,000 Btu/hr. gross output.



Temperature relief for hot water tanks and heaters . . . No. 201 temperature relief valve AGA listed and rated for heat input up to 1,200,000 Btu/hr.